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No. 1

Locusts continue to give the agricultural authorities of the Philippines great concern. Lately the territorial legislature passed an appropriation of \$100,000 to fight the pest, voting down various amendments for smaller amounts.

Bottles and broken glass thrown carelessly away have been proved one cause of forest fires on the mainland, as they concentrate the rays of the sun upon dry stuff. An inspector in the northwest, searching for the cause of an incipient blaze among dead leaves, which he stamped out, discovered the bottom of a beer bottle lying on the leaves upon which the sun was playing its rays.

Some weighty pineapples grown on Ceylon estates, the Kew variety being mentioned, are told about in the Tropical Agriculturist. Four, from as many different growers, have their weights given as 16, 20, 21 and 24½ pounds.

An article advocating increased growing of corn in Hawaii, with regard to the local market for both breadstuffs and animal feed, is reprinted in this number. Its author, Doctor Wilcox, has also lately produced articles advocating the standardizing of Hawaiian coffee for the outside market, arguing the profitableness of the coconut industry for Hawaii and presenting the adaptability of algaroba beans for human food material—both toothsome edibles and a substitute for coffee devoid of caffeine being capable of derivation from algaroba bean meal. A local man, it is stated, has patented a process for producing the coffee substitute, an article that should be welcome to the dietary of those with whom the real thing disagrees.

A forest note from the national agricultural department says "it has been suggested that guavacan, a very hard wood of Central America may furnish shuttle blocks to supplement dogwood and persimmon, now much used and in danger of exhaustion." Perhaps manufacturers of the article mentioned would find just what they require in some of the hard woods of Hawaii. For instance, some of the waste wood of the Hawaiian Hardwood Company's mill might be found to suit the purpose.

With its annual report for 1913 the Massachusetts Forestry Association sent the Forester its Christmas greetings neatly printed on a slip of paper grained to resemble heart of beech. The report contains a list of 3382 members of the association, including life and contributing, besides 28 clubs holding membership in it.

In the latest Official Ayreshire Record, issued at Brandon, Vermont, is presented the "world's champion Ayreshire cow." This is "Auchenbrain Brown Kate 4th, 27,943 A. R. 547," owned by Penshurst Farm, Narberth, Pa. "She gave during the year," says the Record, "10,820 quarts of milk, at a cost of less than one and three-fourths of a cent a quart, which was sold at five cents a quart, making an income from her milk above cost of food consumed of \$541. She was selected and purchased in Scotland by Mr. Percival Roberts, Jr. She is a very attractive looking cow, weighing about fourteen hundred pounds." Some cow, truly. With milk at 12 cents a quart, "Kate" would be a gold mine in Honolulu. People would wish even to sell "Mountain King" stock to get an interest in her.

INDEX TO VOLUME X.

With this number is presented the table of contents, with analytic index, of Volume X, covering the calendar year 1913, of the Hawaiian Forester and Agriculturist. It has been compiled on the same plan as the indexes for several previous volumes. Both contents and index are arranged alphabetically, in the index the official reports, important articles and some classified data being sub-indexed by alphabet. This system avoids the confusion that would result from mingling the minutia of minor details with the major subject matter of the volume. It may appear that excessive detail is followed, but no compiler of an index can possibly tell just what datum may be desired for looking up by any individual, and it is important that anyone can find exactly what he seeks with the least modicum of research. In itself the index reveals a wide range of information covered in the twelve numbers of this little magazine, bearing upon the agricultural industries of these islands, in addition to the exhaustive monthly reports of the divisions of the agricultural department of this Territory.

One of the principal by-products of the national forests of Japan is furnished by mushrooms, which have yielded in one year a revenue of a million dollars.

* Articles of clothing from wood fiber are being made in Europe. The material for a suit costs about fifty cents. Clothing made of this material, however, can not be washed.

REPORTS OF DIVISIONS.

Reports of the various divisions of the agricultural department for the month of December show effective work all round. In that of animal industry Doctor Nørgaard explains as fully as possible the mortality in the dog quarantine, fixing the responsibility largely on the importers of delicate—in some cases invalid—pets on account of their having brought in the animals at an inclement season. At the same time he renews in unmistakable tones the solemn caution against the introduction of rabies, hinting the possible necessity of prohibiting the importation of canine stock altogether. Particulars are given of a new problem in bovine tuberculosis control, arising from the absence of law to compel the inspection of milch cows whose product is not for sale. This he is handling in judicious manner. Hog cholera has re-cruded on the island of Oahu, the matter being complicated by reports of disease in various quarters which are doubted to be cholera. Great care is being exercised to save owners of hogs the expense of serum treatment where it may not be necessary.

Superintendent Ehrhorn shows the exclusion of several dangerous pests by the division of entomology, also the introduction of more beneficial insects to combat pests that are present. He gives interesting information on the white ant, whose discovery in the Capitol grounds arboriculture has lent fresh importance to its existence here. The prohibition of plant introduction here without a federal permit, mentioned by him, should be made as widely known as possible by residents in their correspondence and by the press.

In the absence of the superintendent of forestry the forest nurseryman, Mr. Haughs, tells of the work of that division, which shows a large distribution of young trees, considering the heavy drafts made upon the stock for some months previously. Nearly 3000 plants taken by corporations is pleasingly indicative of the continued interest shown in forestry on the part of big capital.

Superintendent Larrison reports steady progress by the division of hydrography on the different islands in the various means of determining the water resources of the Territory for irrigation, light and power. There is a suggestion that the service might be accelerated with additional funds.

To secure a merit badge in forestry, boy scouts are required, among other things, to identify 25 kinds of trees.

The largest tree in the United States is said to be the "Mother of the Forest," a giant redwood in the Calaveras bigtree grove in California. It is supposed to contain 140,619 board feet of lumber. There are, however, many claimants for the honor of being the "largest tree" and the "oldest tree," and these claims, according to foresters, can not always be verified.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, Dec. 31, 1913.

Hon. W. M. Giffard, President and Executive Officer, Board of Agriculture and Forestry.

Dear Sir:—I beg to submit herewith a report on the work of the Division of Animal Industry for the month of December, 1913:

Bovine Tuberculosis Control.

Only a small number of dairy herds have been tested during the month, but among these it is worthy of note that a private herd, that is, one from which no milk is sold, and which for some reason or other has hitherto never been tested, was found to contain more than 33 per cent. of tuberculous animals. In accordance with the generally accepted interpretation and subsequent enforcement of the local milk ordinance, a milk producer who sells no milk does not need to take out a license, and, as only the applicants for licenses are referred to this Division for testing, the dairy in question escaped notice until our attention was called to it by the importation of five pedigreed "Dutch Belted" dairy cattle.

It was then learned that these valuable animals were to be part of an untested dairy herd consisting of more than 20 head, and it was made clear to the owner that in all likelihood it would not be long before the imported cattle would become infected and would have to be destroyed. The tuberculin test revealed the presence of seven tuberculous animals, all of which were found on post mortem examination to be suffering from the disease to a more or less advanced degree, one even having the lymph glands of the udder affected, and there can be little doubt that, had another six months been allowed to pass before the tests were made, every one of the animals not naturally immune would have been infected, and unless effectively segregated the disease would have reached the imported animals in short order.

This case goes to prove the danger of withholding the family cow or private herds from the regular tests, and it is the intention of this Division to locate all such cows or herds and persuade the owners to have them tested.

Applications are already on hand for the retesting of a number of the larger herds in which one or more reactors were found the last time, and this work will be resumed without delay.

Hog Cholera.

According to a report received from Doctor Elliot the disease has made its appearance among the hogs belonging to a plantation in the neighborhood of Hilo, where no hogs have been pur-

chased or brought in for a long time. Every precaution has been taken to prevent its further spread and, as the cases which have come under observation seem to be of a mild form and only a few have died, the outbreak does not seem to call for any action from this office. Explicit instructions have been sent to Doctor Elliot, who is fully capable of dealing with the situation.

The outbreak on Kauai has, according to Doctor Glaisyer, subsided, while the suspected outbreak in a large piggery near Wahiawa as reported on two months ago failed to materialize. Last week, however, the owner of the establishment reported that one large sow had died and two more were sick. The place was visited and a post mortem held which failed to show definite symptoms indicative of hog cholera, while pneumonia appeared to be the undeniable cause of death. Neither do the two sick hogs appear to be suffering from this disease, for which reason the immunization of the herd with serum was postponed to await the outcome of these cases. Unfortunately it cannot be definitely ascertained whether the disease has ever been in the herd even though a large number of hogs is said to have died during 1912. If these deaths were due to cholera there would be no great cause for alarm, but if not the appearance of the disease would undoubtedly result in great loss. For this reason everything is held in readiness for speedy action, but as the cost of immunizing this large herd will amount to several hundred dollars it was felt requisite that the diagnosis be definitely established first, even though the delay may result in the loss of a number of hogs.

Mr. Sheba, editor of the Hawaii Shinpo, informs me that hog cholera has again made its appearance in the Moiliili District, where it will be remembered the present epidemic made its first appearance and where it is said more than 1000 hogs died, in fact every hog in the district, before the fact was reported to this office. In an article on hog cholera published in the Hawaii Shinpo two months ago, it was urgently advised that no hogs be brought into this district or into any pens or sites where hogs had died from cholera without first being serum-immunized or else until at least six months had passed since the last death. This warning has not been heeded with the result that the disease has again broken out.

These enterprising hog raisers, all Orientals, are now looking for a tract of land where no hogs have been kept before, but if they continue along the same lines as hitherto, disregarding the advice and declining the assistance of this office, it will be but a short time before they will have the disease transmitted to the new place and possibly infect other places in the neighborhood (it was in Kalihi they were inquiring for land). It would therefore be well for them to realize that the sooner they adopt radical measures the smaller their loss will be, even though the initial cost of the serum treatment—two to three dollars per head of large hogs—does seem almost prohibitive. Mr. Sheba has kindly

volunteered through the columns of the Shinpo to elucidate the subject and to answer all questions pertaining to it, submitting those beyond his knowledge to this office. As this had just been written a telephone message was received stating that five large brood sows had died, while the two already sick seemed to be getting better. It was therefore decided to go at once to Wahiawa in order to ascertain, by post mortem examination of the dead animals, whether the cause of death was really hog cholera or whether faulty feeding or incidental poisoning of the feed by lye, pearline or other dish-cleansing preparations might possibly be held responsible. It was found that only one of the hogs showed any of the symptoms generally accepted as pathognomonic, that is, the ulcerations of the mucous membrane of the small intestines at the exact place where they join the large intestines, and these ulcers were so insignificant in size that it was decided to await further development before resorting to the serum treatment. In the meantime a chute was built for this purpose and the following day a careful investigation of the food supply, that is, the kitchen swill from the infantry and cavalry messes at Schofield barracks, was undertaken.

In this work I was kindly assisted by Doctor Mason, the senior veterinarian of the Fourth Cavalry, who accompanied me to all the various kitchens from which the concern in question obtains its swill. It would seem that, for some reason or other, a bulletin pertaining to the careful separation of edible swill from offal without feed value, such as coffee grounds as well as sweepings and other garbage, had been issued a few days previous, and that the requisite receptacles, large galvanized iron barrels with tight fitting covers, had been provided, at least three for each company mess. An inspection of these receptacles, however, showed in a number of cases that the one intended for the edible swill contained both tin cans, lemon peels and coffee grounds, and that the garbage cans contained much edible swill. In all such cases the mess sergeants were sent for and the injurious effect and heavy losses sustained by those who buy and pay for the swill were explained to them. Inquiries were also made in regard to the use of lye and washing powders in cleaning the dishes and pans, but in no case could it be found that such poisonous material had reached the swill barrels, even though it is possible that more or less empty lye cans and similar containers and cartons may have been thrown into them. It was explained that in the future the swill from each mess will be kept separate and fed to the same hogs every day in order that carelessness may be traced to the men guilty of it, and it is hoped that this measure will have the desired effect.

On a subsequent visit to the piggery it was found that all sick hogs seemed to be improving and that no new cases had developed, which speaks strongly in favor of the disease not being hog cholera.

That the losses sustained on this island have been considerable is testified to by the fact that the past month saw the importation of nearly two hundred butcher hogs from the Coast, the first such shipment for more than four years.

Rabies and the Dog Quarantine.

Alarming reports of the constant spread of rabies in the Pacific Coast States continue to arrive by tourists and visitors to the mainland as well as by the newspapers and official reports. Both Seattle, Portland and Vancouver appear to be badly infected, and were it not for the incentive to circumvent the law engendered by an order prohibiting absolutely the importation of dogs to the Territory such measure would be submitted for the consideration of the Board. In the meantime I regret to report the loss within a period of only two weeks of seven dogs in quarantine. As these dogs died from various causes no satisfactory explanation can be offered except the unusual cold and rainy weather which may have acted as a deleterious factor in reducing the vitality and power of resistance to ailments inherent or acquired by the animals in question. The suggestion of poisoning due to either negligence or malice is refuted by the official report of the federal food analyst and chemist, which is appended hereto. Intestinal parasites were prominent factors in every case and treatment for the same also tended to weaken the dogs, some of which were of very delicate constitution and should not have been imported at this time of the year. The complaints made about inadequate facilities for the housing and care of the animals at the quarantine station can at best be sustained in the case of three French toy poodles, which not alone were very delicate but also heavily infested with tape worms when they arrived, and as the importer was fully aware of the quarantine regulations and familiar with the premises it would seem that a more favorable season should have been selected for the importation of these animals, even though they came from more severe climatic conditions than those of Hawaii. To restrict or in any way change the regulations in favor of such animals can simply not be thought of, and while the climatic conditions of this winter may not occur again for years it is recommended that a small house be built containing 8 or 10 cages for lap or toy dogs in which such delicate animals can be kept at least during the night when the keeper cannot be near them. Such a house would be of value not alone from a sanitary standpoint but would also serve to guard valuable dogs against theft and accidents of various kind. Plans and specifications for such a house are herewith submitted.

I also beg to recommend that the keeper's quarters be enlarged so as to allow him to keep his family with him. The experience gained during the past few years has proved definitely that the position as keeper of the station must be filled by a reliable man

of good habits and that owing to the secluded location, more than one mile from the nearest street car line, a single man soon tires of the monotony and lonesomeness of the position and either develops bad habits or leaves the station unguarded for longer and longer periods unless he takes up with such company as can be found on the Beach Road after dark.

As I believe finally to have secured the services of a reliable man and one who is vouched for by the very best authority it would seem wise to provide quarters suitable for his keeping his family with him. In this connection I take the liberty to enclose some correspondence which is self-explanatory, and while I cannot, for obvious reasons, recommend the acceptance of the offer therein contained it nevertheless appears to me to be a guarantee of good faith and the desire for a permanent position through satisfactory services on the part of the present incumbent. If therefore this recommendation is favorably acted upon I shall be glad to prepare plans and specifications for the enlargement of the present quarters.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Dec. 31, 1914.

Dr. V. A. Nörgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to submit my report on the work during the month of December, 1913:

Tuberculosis Control.

The following dairy stock has been tested:

	T.	P.	C.
Mrs. B. M. Allen, 26 cows, 1 bull.....	27	20	7
Mrs. F. L. Whitney, 2 cows.....	2	2	0
Tom Hollinger, 5 cows.....	5	5	0
Antone Peris, 4 cows.....	4	4	0

Seven animals were condemned and branded out of Mrs. Allen's herd. This is a large percentage but was to be expected as no tests have ever been made in this dairy. The infection was undoubtedly brought in by a cow purchased from a local dairy some four years ago and which on post mortem examination was found to be badly diseased. In each case the local reaction was well marked and unmistakable and the reliability of the test was fully demonstrated on post mortem examination at the slaughter house. The results of these examinations are given below as follows:

No. 1. Carcass in fair condition and dressed 298 lbs. A few small semi-calcified nodules were present in the lungs; one supra-mammary gland showed the presence of small young tubercles; microscopical examination of smear preparations of the same showed tubercle bacilli.

No. 2. Carcass in medium condition and dressed 334 lbs. Calcareous nodules in mediastinal lymph glands and one small nodule containing cheesy pus in the lungs.

No. 3. Carcass in very good condition and dressed 404 lbs. Retro-pharyngeal lymph gland enlarged to 6 inches in diameter and contained a mass of cheesy, gritty tuberculous material. The lungs were a mass of nodules varying in size from a dime to 3 and 4 inches in diameter and in different stages of development. All bronchial and oesophageal glands were affected.

No. 4. Carcass in poor condition, dressing 288 lbs. One bronchial-oesophageal lymph gland was greatly enlarged and contained a mass of cheesy, semi-calcareous tuberculous material. No other lesions were found.

No. 5. Carcass in good condition, dressing 452 lbs. Retro-pharyngeal gland enlarged to 6 inches in diameter, containing large cavities filled with creamy pus, also small nodules filled with semi-calcareous tuberculous material. The lungs contained numerous nodules of different sizes and in varying stages of development.

No. 6. Jersey heifer in good condition, the carcass dressing 240 lbs. The disease was confined to a few small tuberculous nodules in the retro-pharyngeal glands and large abscesses in the liver.

No. 7. Holstein heifer in good condition, carcass dressing 320 lbs. The disease was confined to four small nodules in the right retro-pharyngeal lymph gland.

Thorough disinfection of the stable and premises was effected; it was also recommended that the use of the old barn and stables be discontinued and a new one erected in its place. The owners were also strongly urged to have the remaining animals re-tested at the end of three months as undoubtedly others are infected as all had been exposed to the disease for some time.

Importations of Live Stock.

Dec. 2—S. S. Honolulan, San Francisco: 1 Berkshire boar, F. G. Krauss. This boar was imported by Prof. Krauss of the College of Hawaii for breeding purposes and is to be used both at the College and at his Haiku homestead, Maui. Owing to the absence of health certificates the animal was held under observation for two weeks at the quarantine station and before leaving was rendered immune by a suitable dose of anti-hog cholera serum. 30 crates poultry of mixed breeds.

Dec. 3—S. S. Manchuria, San Francisco: 3 white French poodles, C. C. von Hamm.

Dec. 4.—S. S. Niagara, Vancouver: 1 white Spitz dog, H. Scott.

Dec. 8.—S. S. Sierra, San Francisco: 1 dog (brindle bull terrier), Mr. Walsh; 1 dog (white Spitz), Mr. Heinfedro; 11 crates poultry of mixed breeds.

Dec. 14.—S. S. Arizonan, Seattle: 14 horses, 1 cow (dairy short horn), 186 hogs, 23 crates poultry, A. L. McPherson. The above 186 head of hogs represents the first shipment of butcher hogs into the Territory since September, 1909.

Dec. 17.—S. S. Lurline, San Francisco: 2 horses, Col. C. L. Reihm; 3 horses, K. Kanda; 2 horses, Quartermaster's Dept.; 1 goat, H. Waterhouse Trust Co.; 25 crates poultry.

Dec. 23.—S. S. Wilhelmina, San Francisco: 35 crates poultry.

Dec. 25.—S. S. Mongolia, San Francisco: 1 cat, steerage passenger; 1 dog (brindle bull terrier), Julius Bayer.

Dec. 30.—S. S. Honolulan, San Francisco: 1 horse, Col. F. H. French; 4 mules, Hind, Rolph Co.; 13 crates poultry.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, Dec. 31, 1913.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work of the Division of Entomology for the month of December, as follows:

During the month 34 vessels arrived at the Port of Honolulu of which 22 carried vegetable matter.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	1201	26,805
Fumigated	14	1,914
Burned	69	77
Returned	1	1
Total inspected.....	1285	28,797

Of these shipments 28,532 packages arrived by freight, 104 packages by mail and 161 packages as baggage of passengers and immigrants.

Rice.

During the month 7115 bags of rice arrived from Japan, all of which was found free from pests and was passed for delivery.

Pests Intercepted.

Fifty-three packages of fruit and 4 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries and being prohibited from entry were seized and destroyed by burning.

In a shipment of plants from Japan were found a number of *Anomala* grubs in the soil, also several *Scaraboid* grubs and an adult *Scaraboid* (*Cetonia* species). In the trunks of two trees were found the larvae of a tree borer belonging to the *Cerambycidae* and two species of click-beetle larvae were found in the matted roots. The shipment was condemned and destroyed.

In another lot of soil around plants we found the larvae of a fly (*Tipulid*), a dung beetle (*Histerid*), and two species of ants (*Lassius niger* and *Prenolepis obscura*).

Nineteen plants were refused entry into the Territory for not having any permit from the Federal Horticultural Board of the U. S. Department of Agriculture, Washington, D. C. All of these were brought by passengers and immigrants from foreign countries and were seized and burned. Under Rules and Regulations of the Federal Horticultural Board it is absolutely necessary for all persons who either bring or ship into any State or Territory of the United States any plant or parts of plants, first to obtain a permit from the Federal Horticultural Board, Washington, D. C. Application blanks can be obtained from the Superintendent of Entomology of the Board of Agriculture and Forestry, who is the authorized agent of the Federal Horticultural Board.

All five-leaved pine trees are prohibited from entering the United States under Quarantine Order No. 7 of the Federal Horticultural Board. One such plant was seized and destroyed during the month. These species are susceptible to the white pine blister rust (*Peridermium strobi*) which has caused serious destruction to the pine forests of Europe and Asia and has found its way into a few limited sections of the United States.

One package of plants arriving by parcel post has been returned to the original shipper under orders from the postmaster-general. Hereafter no plants or parts of plants can be sent into the United States or Territories from foreign countries by parcel post. It has been found necessary to take these precautions on account of the difficulty of keeping check of all such shipments, which always present great danger of letting in some serious pest unobserved.

During the month the president of the Board handed me some material infested with white ants, which he had received from the Superintendent of Public Works of the Territory. The material was taken from the bandstand in the Palace grounds. The white ants infesting the material are the same as found by me in the wharf-piling on Pier No. 7 and which were also found doing damage to the woodwork in the building at Kamehameha School.

The species has been identified as *Coptotermes lacteus* and is recorded from Australia. From the present distribution here it must have been in the islands for a long time. Doctor Perkins in the Fauna Hawaiiensis, in writing on white ants or termites, mentions two species and also says: "*One if not two other species have been imported and are probably established.*"

Hilo Inspection.

Brother M. Newell at Hilo reports the arrival of seven steamers of which four brought vegetable matter consisting of 226 lots and 4316 packages. One lot of holly was burnt on account of fungus.

Beneficial Insects.

One hundred *Coccinella bruckii*, an aphid eating ladybug, were given to the department by Mr. O. H. Swezey of the Hawaiian Sugar Planters' Association for distribution and were liberated in Manoa Valley where an abundance of aphid was found on hibiscus. These ladybugs were collected by Mr. Fred Muir in Japan and those liberated were reared by Mr. Swezey from the original sending, none of which were liberated on account of finding parasites infesting the pupae. Mr. Swezey has liberated large numbers of this ladybug on the various islands with the hope of getting them established. Four lots of Japanese beetle fungus were distributed on Maui.

Inter-Island Inspection.

During the month of December 58 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	392	packages
Taro	1045	"
Fruit	26	"
Vegetables	62	"

Total passed 1525 "

The following packages were refused shipment on account of being either infested with pests or having soil attached to the roots.

Plants	10	packages
Fruit	12	"
Vegetables	1	"

Total refused 23 "

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, Dec. 31, 1913.

W. M. Giffard, Esq., President and Executive Officer, Board of Agriculture and Forestry.

Dear Sir:—The following report gives the principal work done during the month of December, 1913:

Nursery.

Distribution of Plants.				
	In seed boxes	In boxes transplanted	Pot grown	Total
Sold . . . . .	....	150	190	340
Gratis	1500	350	662	2512
	1500	500	852	2852

Collections.

Collections on account of plants sold amounted to \$ 4.30.

Plantation Companies and Other Corporations.

The distribution of trees for the month is as follows: 1000 in seed boxes, 1500 in transplant boxes and 400 pot grown. Total, 2900.

Makiki Station.

The work at this station has been principally routine; namely, sterilizing soil, transplanting trees and otherwise building up a stock which was getting low owing to the heavy demand which has been made for trees during the past two months.

Honolulu Watershed Planting.

The work on the face of Sugar Loaf is progressing and a great many holes are now ready for planting. These will be filled with koa trees just as soon as the weather is suitable. We have over 3000 koa trees in tin cans at the small nursery on the ridge below Sugar Loaf. Clearing off and making holes have constituted the principal work during the month.

U. S. Experimental Planting, Nuuanu.

With the assistance of the prisoners and one man from the Nursery, also the man employed to look after the trees, two days were spent in going over the different plots and filling up blanks

where trees had died during the dry spell. The most of the trees are making a splendid growth and are now large enough to take care of themselves. Owing to lack of funds the man who has been employed on this work for the past three years was discharged at the end of December.

Congressional Vegetable Seed.

By last mail we received from Washington 50 mail bags containing 10,000 packages of Congressional vegetable seed. Each package contains five varieties. The complete list is as follows: 3300 packages V-1—beans, lettuce, muskmelon, onion and radish; 3300 packages V-4—corn, lettuce, onion, radish and turnip; 3400 packages V-5—peas, cucumber, lettuce, onion and radish.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, Jan. 12, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during December, 1913, is submitted:

Construction Work.

The construction work in December in connection with the installation of 12 new clock register stations on Maui, four new clock register stations on Kauai, and 18 new staff gage stations on Oahu progressed more rapidly than during November on account of more favorable weather conditions. The program of replacing old staff gage ditch stations—which have in the past estimated the low water discharge of streams by the amount of water diverted by ditching—by clock register stations on the streams, at points above all diversions, will progress as rapidly as the semi-annual allotments of the territorial funds are made available.

There are now established, or in process of being established, on streams in this district the following types of clock register stations: Gurley, 1; Friez, 8; Stevens, 19*; Barrett & Lawrence, 6; Watson, 7—making 41 in all.

The installation of these stations involves more than the construction of intakes, wells and shelters, as these are, nearly always, established far up into valleys, both uninhabited and in-

* Three owned by cooperating parties.

accessible. These conditions require the construction of many miles of foot trail, bridges, or cables for flood measurements, the blasting and clearing of cross sections, and the building of permanent controls.

G. K. Larrison, Superintendent.

December 5, 9, and 26 were spent on reconnaissances of the Heeia and Kaneohe basins on windward Oahu. The construction of 18 stream and ditch stations in these basins was started on December 26. These stations are being built and will be maintained in cooperation with the Heeia Agricultural Co. on a half-and-half basis.

December 13 to 21 were spent inspecting the construction work in connection with the installation of the new Stevens clock registers on the Honomanu, Wailuanui, East Wailuaiki, West Wailuaiki, East Kopiliula, West Kopiliula and Hanawai streams on Maui. All of these stations, except the Hanawai, were completed with the exception of the foot bridges for flood measurements. The night of December 15 was spent in the rim of Haleakala crater, elevation 10,000 feet. A monthly rain and snow gage will probably be established at this place during the coming year.

The balance of the month was spent on general administration work, including reports, estimates, and computations.

W. F. Hardy, Field Assistant, Kauai;
D. E. Horner, Field Assistant, Kauai.

Mr. Hardy spent 30 days in the field, visited nine stream gaging and five mountain rain gaging stations, and made two measurements. Most of the month was put in on the construction of the Hanalei station.

Mr. Horner spent 31 days in the field, visited seven stream gaging and four rainfall stations. Twenty-seven days were spent on construction of the Hanalei and Kalihiwai stations.

J. C. Dort, Office Engineer, Oahu.

Mr. Dort spent five days in the field, visited five stream gaging stations, three rainfall and two evaporation stations, and made five stream measurements. The balance of the month was utilized on general office and computation work in connection with the 1913 Progress Report.

C. T. Bailey, Assistant Engineer, Maui;
Howard Kimble, Assistant Engineer, Maui.

Mr. Bailey spent 23 days in the field, visited 15 stations and made two measurements. Mr. Kimble spent five days in the

Honolulu office and 26 days in the field on Maui replacing Mr. Christiansen. He visited two stations and was employed all of his time on Maui on the construction of clock register stations on the Hanawai, West Kopiliula, East Wailuaiki, East Wailuanui and West Wailuanui streams.

E. O. Christiansen, Assistant Engineer, Maui.

Mr. Christiansen spent December 1 to 3 assisting Mr. Bailey on Maui, and from December 4 to 31 on vacation leave. His resignation to take effect on December 31, 1913, was accepted.

H. A. R. Austin, Junior Engineer, Oahu.

Mr. Austin reported for duty on December 27 and spent December 27 to 30 on general office work. On December 31 he accompanied J. C. Dort, office engineer, on a trip to Mt. Kona-huanui, Mt. Olympus and the Kaau crater to read rain gages.

G. R. White, Field Assistant, Oahu.

Mr. White spent 16½ days in the field, visited six stream gaging stations and three rainfall stations, and made seven stream measurements. From December 9 to 16 were spent on construction and improvement work in the Kailua valley, and from December 26 to 31 on gage installation and construction work in the Kaneohe and Heeia valleys, all on windward Oahu. The balance of the month was spent on general office and computation work.

Office Force.

Mr. E. E. Goo, clerk, assisted by John Kaheaku, computer, spent the entire month on general office work, including correspondence, filing, computing, checking, etc. Mrs. Sara Dort and Mrs. Hilda Kennedy were temporarily employed on December 8 at \$2.50 per day to assist on computation work in connection with the 1913 Progress Report.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

There is a flourishing forest school in the Philippines, and 28 men were graduated with the class of 1913.

Under forest regulations in Colombia, rubber gatherers are required to give the trees a rest period in tapping them for gum. The size, number and location of the incisions are regulated by law. In the United States similar regulations are in force in the tapping of pines for turpentine on the Florida national forest.

THE KALO IN HAWAII (VII).

By VAUGHAN MACCAUGHEY and JOSEPH S. EMERSON.

THE CULTURAL REQUIREMENTS OF KALO (*Concluded*).

In the latest issue of the Forester the cultural requirements of the Kalo in Hawaii were discussed in some detail. In recent years there has been a movement on the part of the National Department of Agriculture to establish the kalo and related aroids among the root-crops of the Southern States. The cultural requirements in these regions differ somewhat from those in Hawaii, and the contrasts may be shown by the following extracts from recent bulletins by the U. S. Department of Agriculture:

"For many years the lack of a wet-land root crop has been felt throughout the South Atlantic and Gulf States. In view of the fact that some 40,000 acres in the Carolinas and Georgia have been fully abandoned, with at least half as much ground that is only planted once in two to four years on account of the decreased profits in rice culture in that section, an effort has been made to find profitable crops which may be grown in the rich soils of the coast-plain area of both of the regions mentioned, which are too wet for profitable potato culture.

"The recent increase of interest in starch roots, which may be utilized in the production of alcohol as well as for stock feeding, has lent a still greater importance to this question.

"The aroid root crops are practically new to this country and come from the Tropics. However, their crop season is sufficiently short to allow of their maturing in ordinary seasons before the advent of killing frosts; in fact, one or two of the varieties have been successfully grown with a fair yield as far north as central New York."—*Barrett, Bur. Plant Industry, Bul. 164.*

"The dasheen* requires rich, sandy soil, very moist but well drained. The plant will not be greatly injured by occasional flooding for a short period. Such lands as the so-called hammock lands of Florida are especially adapted for the cultivation of this crop. And low-lying sandy land that is fairly well drained, but still too wet for general field crops, can be used to advantage. On these low lands it would be advisable to plant on ridges.

"Planting should be done as early in spring as the conditions of soil and climate will permit. This may be as early as the first of February in southern Florida and as late as the last of March or the early part of April in the Carolinas.

"Preliminary experiments indicate that it does not pay to use very small dasheens for planting if larger tubers are available, as this may result in the yield being reduced by as much as 15

*The dasheen is the taro of the West Indies and China.

per cent. Tubers of 3 to 5 ounces in weight are preferable for planting. For field culture the tubers, unless very small or very large, are planted, singly and entire, from 2 to 3 inches deep in hills 3 feet apart, the distance between rows being 4 feet. This will permit horse cultivation. In cultivating during the summer the soil should be gradually drawn to the plants and the plants kept free from weeds; they usually require little cultivation after becoming large enough to shade the ground. Well-grown plants will reach a height of $4\frac{1}{2}$ to 6 feet or more by midsummer.

"The crop matures in about seven months, although the tubers can be utilized for home use in six months or less from planting. The harvesting of the main crops may be deferred a month or two, if desired, but if it is to be done at one time, in order to have warm, dry weather for the dasheens to dry properly on the ground, it would not be delayed till there is danger of frost. For this reason it will usually be best to harvest dasheens sometime in October. It will sometimes prove advantageous in practically frost-free localities or where the roots can be protected to leave them in the ground until wanted for use or until spring.

"Where soil and climatic conditions are favorable, dasheens will produce from 4 to 10 pounds or more to the plant. Under experimental conditions at Brooksville, Fla., in different soils and in different seasons, the Department of Agriculture has secured yields ranging from 140 to 450 bushels to the acre. Satisfactory results have not been obtained, even in good soil, when two successive crops of dasheens are grown on the same ground.

"The growing of a dasheen crop is probably no more expensive than that of a potato crop. Although the season for the dasheen is much longer than that for the potato, the large leaves of the former tend by shading to keep down weeds after midseason."
—Young, *Office of Plant Introduction, Circ. 127.*

Geographical Distribution.

Kalo is supposedly a native of India, from there having been taken to Ceylon, Sumatra, Malay Archipelago, China, Japan and Egypt. In more recent times it was brought to Fiji and New Zealand.

The Rev. T. G. Hammond, in an article on the kalo in the *Journal of the Polynesian Society* (Vol. 3, 1894, p. 105), gives the following: "Commonly received tradition all along the West Coast of the North Island of New Zealand . . . respecting the origin of the taro . . . A great ancestor of the Ngaururu and Ngatuanui tribes, named Maru, in one of his voyages from Hawaiki, touched at an island called Te Wairuangangana, and there became aware of the taro as an article of food.

"On his return to Hawaiki, Maru took with him some of the broad leaves of the taro, which, together with his description of the food, so excited the people that they fitted out an expedition to find again the island Te Wairuangangana, and to secure

roots of the plant for cultivation. The expedition consisted of two canoes, well manned, and named respectively '*Pahitonou*' and '*Hakirerc*.' The former canoe was commanded by Rauru, and the latter by Maihi.

"On the outward voyage, *Pahitonou* was wrecked, Rauru and the survivors being rescued by the crew of *Hakirerc*. Going on her way, *Hakirerc* arrived safely at Te Wairuangangana, and application was made to the inhabitants of the island for roots of the taro, which were presented to them by two women, who gave them directions as to the cultivation of the plant, and the requisite behavior on their return journey with such valuable food on board. Following these directions, Maihi was enabled to return safely to Hawaiki, and accordingly introduced the taro to that land."

According to the ancient Samoan mythology "occasional visits are stated to have been formerly made to the abode of the august Tangaloa (the creator or chief god), by parties from the earth, who returned with some useful benefaction from the deity; as for instance, Losi, who is reputed to have been the benefactor of his countrymen by bringing taro from the skies (*O le langi*) on his return from one of his expeditions, or presumably, voyages, to the north-north-east or north-west." Rev. John B. Stair in article on Mythology of Old Samoa, *Journal of Polynesian Society* (Vol. 5, 1896, p. 36).

It was doubtless brought, by the early Polynesians in their migrations, to Samoa, Tahiti and finally to the Hawaiian Islands. According to certain legends of the ancient Hawaiians, the *kalo* originated from the "piko" or umbilicus. A number of varieties are called *Piko*.

Comment has already been made upon the fact that certain regions were preëminently adapted to *kalo* growing, and other regions were quite unsuited. This condition naturally led to traffic in *kalo* or *ai pa'i*, as its portable state was called. This traffic has continued down to the present time. The Honolulu region, on Oahu, the Lahaina region, on Maui, and the Kau district, on Hawaii, are instances of localities that receive much of their *kalo* supply from other places.

Regions noted for the growing of *kalo* are the Waipio and Waimanu Valleys, on Hawaii; the Waihee and Wailuku districts, on Maui; the Wailua, Pelekunu, and Halawa valleys, on Molokai; the Waialua, Kahana, and Ewa regions, on Oahu; and the Hanalei and Kapaa regions on Kauai. There were many other regions famous in ancient times, the above are representative. In general, the islands of Hawaii and Maui, because of their extensive upland regions, were devoted to dry-land or un-irrigated *kalo*; Oahu and Kauai, skirted by broad lowlands, were given over to wet-land or irrigated varieties.

Its history in Hawaii is therefore as long and as full of interest as that of the people themselves. Indeed, the *kalo* probably has as long a period of cultivation as any other plant can

boast of, for it was one of the plants to be earliest utilized by man. It is a staple food of many primitive peoples, because of its easy culture and great food value.

9. WET-LAND CULTIVATION.

The selection of land suitable for kalo-raising is based upon the considerations discussed under Cultural Requirements, and upon such other factors as market facilities, and disposal of crop.

The site having been chosen, the land is cleared. In Hawaiian this clearing process is called *wale*. Rubbish, weeds, and grass are burned off, and stumps, boulders, and other similar impediments dug up. The boundaries of the patch, which are to be embankments, are determined by the shape of adjacent patches and by the water levels. In the Hawaiian language, *mahina* indicates a cultivated patch or field; when cultivated in kalo it is called a *mahina ai*. *Ai* in its most general sense means food, whatever is eaten. More especially it is vegetable food as distinguished from *i'a*, fish or animal food. As wheat and other grains furnish the material for bread, the European "staff of life," and rice is the staple food of Asia, so kalo is *the food* of the Hawaiians, and in the words *mala ai*, *mahina ai*, *ai paa*, *ai pa'i*, *pa'i ai*, *holo ai*, etc., *ai* always signifies kalo or some form of food prepared from it.

The terms *pa'wa* and *kuakua* were also generally applied to both wet and dry fields of kalo.

Dry land fields of kalo or sweet potatoes were designated *mala*. This word was never applied to wet patches, which were always called *lo'i*.

A narrow strip of planted kalo, much longer than wide, was called *mo'o*. *Mo'o* is a general name for all kinds of lizards. A long narrow strip of land, from its resemblance in shape to a lizard's back, was called *mo'o*. If planted with kalo it was called *mo'o ai*. If it consisted of a long row of *lo'i*, or wet kalo patches, it was called *mo'o kauapa lo'i*.

Kalo as it is usually grown in the *lo'i*, or wet land patch, requires considerable water. The digging of water-courses and keeping them free from weeds became a very important matter in the olden times. These water-courses, often of great length, showed no little engineering skill in their construction, and the regulations which necessarily had to be made and enforced to give each patch its proper allowance of water were very precise, and often complicated. From this it will be seen that as water or *wai* was the prime necessity in the cultivation of kalo, an abundance of water, *waiwai*, signified wealth, and the regulations relating to the distribution of water, *ka na wai*, signified law in general. Thus the Ten Commandments becomes in Hawaiian *na kanawai he umi*, the ten water regulations.

The Hawaiian name for rushes or coarse swamp grasses was

akaakai; *lo'i akaakai* designated that particular type of field that was formed by bending down the rushes, covering them with dirt, and then irrigating the field.

The ground within the *lo'i* is broken by means of a mattock or *oo*. *Oo* designates the tool largely used by the natives in cultivation in preference to the implements of modern farmers. The *oo* closely resembles in its manner of use the sharpened stick of *kauila* or other hard wood, used by them previous to their knowledge of iron. The first metal *oo* were blubber spades brought here by the whaling-vessels. The boundaries of a *lo'i* depend largely upon the shapes of adjacent *lo'i*, and upon the relative positions of the various levels along which the irrigation water is to run.

The embankments of the *lo'i* are built up of stones and clods of earth. These embankments were commonly known as *kuauna*.

In former times the *kuauna* between the *lo'i* was much wider than at present. They served as a convenient place on which to throw the grass and weeds pulled up from the *lo'i* until they were wanted as fertilizer. Often sugar-cane, banana plants, or the *ki* plant, grew luxuriantly on these *kuauna*. As *kalo* land increased in value the *kuauna* naturally shrunk in width, and with the advent of the Chinese planter they were often made too narrow to walk upon dry shod. *Hoohu* meant to run along the bank of a *kalo* patch.

Names less frequently used, for the embankments of the *lo'i*, were *ika*, *kaika* and *kuaio*.

The side or border of an upland *kalo* field was called *iwi*. *Iwi* means a bone, a name applied to the long rows of stones gathered from the *mo'o aina* or to a narrow strip of upland to be planted with *kalo* or potatoes. These *iwi* always run in the direction of the slope from the sea towards the mountains. As they coincide with the division lines between the fields, the term *iwi aina* came to mean the boundaries between such lands, and is a term often used in that sense in the descriptions in the Hawaiian language on record in the Land Office.

If necessary considerable soil is taken from the *lo'i* and put upon the embankments so that the surface of the *lo'i* will be below the level of the water supply. *La'ola'o laau* were the little sticks put down to sustain the *kuauna* or bank of the *kalo* patch. Water is then turned in and is soon soaked up by the broken soil. While the ground is still wet it is dug up or plowed several times. The Hawaiians call this labor *mahi-ai*.

It is evident that after long and continuous usage as described above, the soil is sure to become exceedingly sticky, so that the air does not penetrate it. Experiments conducted by Mr. F. A. Clowes in coöperation with the Federal Experiment Station, Honolulu, show that it is desirable to expose the soil, from time to time, to the action of the air. This is accomplished by plowing the fields as deeply as possible after the removal of each crop.

The soil then remains exposed to the ameliorative influences of the weather for a month or more. After this it may be harrowed or worked by hand, and brought into condition to be soaked with water and planted. The thorough plowing, airing, and drying of the soil before replanting greatly increases the yield, and greatly reduces the liability to disease. According to Mr. E. C. Bond, the natives of Kohala, Hawaii, in former times, allowed the *lo'i* to remain fallow for two or three months after each crop—long enough to allow the grass, weeds and other rubbish thrown into the *lo'i* to rot. Sometimes they added fresh soil to the *lo'i*. The Chinese planters, on the other hand, are not in the habit of giving the land a rest. Consequently, while the natives raised good *kalo* with many *ohá*, the Chinese get small *kalo* with almost no *ohá*.

In preparing the land for planting, cattle are sometimes turned into the patch and driven around in it so as to break the clods and puddle the bottom that it may hold water. In ancient times, the solidifying of the bottom was done wholly by hand, large stones or logs of wood being used as pounders. This work was called *paluku* or *paku'i*. The *ha-nu*, which was the thick large heavy end of the coconut leaf, was used for beating the sides of the patch. After the soil by these methods has been put into good condition, and the embankments are solidly plastered with mud, the field is harrowed and water is turned in to stand for a few days.

It is interesting to observe that the primitive Hawaiian "taro patch" is very similar to the rice-patches of the Orient, in construction, configuration, and maintenance. The following description of the rice fields of Japan, by Mr. S. A. Knapp, of the U. S. Dept. Agriculture, would apply perfectly to the wet-land *kalo* fields of Hawaii. "The lands are divided by levees into small fields. These are of no regular form . . . The levees vary in width from 1 foot for field divisions and paths to 4 feet for main embankment roads. . . . Many of the rice fields in Japan average scarcely more than 35 feet square, and the boundary levees have such wavy lines that they look as if made by hogs in a frolic. Under modern conditions the horse and the ox could be used in tillage, but there are no paths which such animals can traverse to these minute fields; and, if there were, the tracts are too small for the use of plow or harrow, because there is no room to turn, much less to follow the angular boundary lines. If a farmer owns several tracts it is seldom that they are adjacent. . . ."

Mr. Knapp describes a tract of twenty-five acres that formerly contained 409 irregular fields. By proper replatting there are "now 138 regular fields, with perfectly straight water-courses and roads wide enough for two loaded carts to pass . . . the area of arable land is greatly increased by breaking down

the numerous grass ridges and throwing their space into productive soil. About one-tenth is thus gained." (Bur. Plant Industry, Bull. 35, p. 16.)

(To be continued.)

HAWAII FOR CORN.

Dr. E. V. Wilcox, agent in charge of the federal experiment station, sees corn coming into its own in Hawaii. Corn will be one of the large crops here, according to Doctor Wilcox. He says in the Honolulu Star-Bulletin:

"Corn is coming into its own in Hawaii. The territorial marketing division finds that it can sell 15 tons of corn per week at \$40 per ton or better. This is nearly \$15 per ton above the farm price of corn on the mainland. But a thorough shakeup in the corn business is needed. In getting a fresh start in agriculture in Hawaii attention should be given chiefly to plain, ordinary farming—to raising things to eat. Put corn at the head of the list. There is no crop equal to it as food for man and beast. Recent repeated experiments have shown that it is superior to wheat, barley or rice. There is no other grain on which animals can be raised from weaning to maturity without balancing the ration with other feed. I recently saw fine healthy hogs which had tasted nothing but corn and water from the time their mothers weaned them; while other hogs, fed on wheat or barley, were half-size and sickly. Corn is sometimes said to be 'heating' as a horse feed. But there are thousands of sleek horses in the hottest parts of the South, which never saw any other grain than corn.

"It is curious that in Honolulu corn should be thought good for chickens only. Corn beats barley for horses any day. But until corn is fed more extensively to other animals than chickens, don't raise any corn except varieties with small kernels and of rich yellow color. Big-kernel corn can hardly be sold at any price in Honolulu.

"The farmers of Hawaii should raise what is needed for food in Hawaii. Make corn one of the main things. Horses, cattle, pigs, chickens and turkeys will rise up to bless you for it. And why forget man? Why not have a mill to make corn meal? Did you ever hear of a man who would turn up his nose at corn-meal mush, johnny cake, corn pone or hominy? Did you ever hear of a case of beri-beri or malnutrition in corn-eaters? The 'corn-fed' girls of the middle states are the standard of human perfection. If the Orientals would eat corn in place of rice, they would have better bone and muscle, and would become Americanized sooner.

"A Little Rock editor once said that Arkansas produced corn of such virtue that whisky made from it tasted just as good coming up as going down. The Hawaii brand of corn is equally

good. But when young pigs sell at 30 cents per pound, and chickens and turkeys at 35 cents, it pays better to transform corn into meat and padding for human ribs. Judged by mainland standards, Hawaii should have 100,000 acres of corn. With a little patch of corn like that "in our midst," Australian meat, Japanese rice and mainland cold-storage poultry could stay at home to feed other hungry mouths."

SOME INTERESTING POULTRY QUESTIONS ANSWERED.

To a correspondent who has sent a number of queries to the *Poultry Magazine* of South Australia, Mr. Graham Hope replies as follows:

Q.: (1) How long is it necessary to feed chicks on the dry method system as contained in a former issue? (2) At what age are chicks supposed to reach maturity? (3) How to feed them when they are matured for (a) egg production, (b) breeding purposes, (c) to bring on an early moult? (4) How long is it absolutely necessary to give onions to chicks as a prevention against worms? (5) Is it necessary to separate pullets from cockerels if they have free range? (6) At what age can chicks do without a foster-mother?

A.: (1) We feed our chicks on the dry feed method until they are matured. After two weeks old the dry meal consists of a very large proportion of bran, the oatmeal being reduced. (2) The age at which chickens mature varies from less than six months to eight or nine. The heavy breeds take longer than the light ones. Pullets nearing maturity should be fed on a very plain diet, no meat or stimulating food being used, so as not to force egg production at too early an age. (3) (a) We never force the pullets for egg production, but feed on the same simple diet as used at the Australian laying competitions. Again ample green food together with milk I find the secret for great egg production without the ill-effects of forcing the birds by use of meat and stimulants. Don't overfeed, as a fat hen means no eggs. (b) Grain at night buried in deep litter to make them work for their food. Every other morning a mash consisting of 2 parts bran, 1 part chaffed lucerne mixed with boiling water, and then left for half-an-hour to swell out, after which period it is dried out with pollard to a crumbly consistency. A small portion of salt is added to the boiling water. Never feed in a warm state or any condiments added, as this would force egg production, and would mean weak germs. On the other mornings grain is fed in litter. Mid-day ample green food is given. In summer each bird gets a half-teaspoonful of Epsom salts in the mash at intervals. Only give as much food as they will eat up greedily, and keep them busy; a fat, lazy hen is a bad breeder. (c) Knock off all soft food and rather underfeed, giving Epsom salts in the drinking water; as soon as the moult has well started

give soft food, with a pinch of sulphur added. Both sunflower seed and linseed meal are valuable additions to the bill of fare during this period. Green food is important. By putting the birds in a warm coop the moult will be hastened. It is generally accepted that it takes a fowl from 90 to 100 days to change its coat of feathers. (4) We give our chicks onions up to two months. We find this vegetable one of the most valuable for poultry, and give it freely to the adult stock. (5) I should advise the separation of the sexes, as otherwise the pullets are liable to come on to lay at too early an age. (6) It all depends on the style of foster-mother used and weather conditions. During this month our chicks at one month old have had no foster-mother.

Your queries have keenly interested me, and I trust my replies may be of some service.—*Agricultural Gazette* (N. S. W.)

CAN MULES BREED?

La Hacienda shows a photograph that says Yes! How often, we wonder, have all those to do with estate work, either in North or South America, as well as in many other centres, discussed the "whys" and the "wherefores" that prevent a mule from breeding. We have always understood that such a thing is impossible. Venezuelan llaneros, American breeders, negro overseers, Spanish hacenderos, East Indian coolies, even Portuguese and Chinese shopkeepers, have all in turn discussed the matter with us, and proved conclusively that for a mule to foal is impossible. In spite of all this, our contemporary, *La Hacienda*, of Buffalo, triumphantly includes a photograph of a mother mule and a foal, with these words underneath (see their August issue, p. 349): "Mula que dio á luz un potrello en la Hacienda Hortela, Pilar de Alagoas, Brasil." (Mule which gave birth to a foal on the Hacienda Hortela, in Pilar de Alagoas, Brazil.) Surrounding the two animals, which stand side by side, is a crowd of twelve men and boys, and probably there were others that could not be squeezed in the picture. We wonder whether all of these realized at the time how many tongues will be set wagging again over this evergreen controversy, at the sight of the photograph of this mother and son, since *potrello* not *potrella*, is used.

To further remove any doubt on the matter, we reproduce the following paragraph from the *Agricultural News* of Barbados, W. I., of a similar case in Cyprus, but in this instance it will be seen that two young mules had made their appearance. This would disprove any claim of the occurrence being a freak.

Under the heading "A Fertile Mule," our West Indian contemporary reports that some very interesting correspondence recently appeared in *The Field* (August 2nd and 9th, 1913) concerning the case quite lately observed in Cyprus, of a female mule with foal at foot. The observations were recorded in the first

instance by G. J. Harvey, M.R.C.V.S., Government Veterinary Surgeon, Nicosia, Cyprus. When called to the case he was informed that the foal was the second one born; last year the animal had given birth to a filly foal which lived two months. The present one was a colt foal two months old by a jack donkey and resembled somewhat a young donkey, but was bigger. The mule herself was 6 years old, 13.2½ hands high, and bay with black points. There were no special marks or stripes, and the animal was of a very good type. Inquiry seemed to indicate that she was bred from a she-donkey, sire unknown. At the time of writing she was giving milk, and the foal suckled in the presence of the veterinary surgeon, who was able to certify that both mule and foal were genuine.—*Tropical Life*.

A rancher has applied for the rental of 320 acres on the Pike national forest, Colorado, to be used in connection with other private land, for raising elk as a commercial venture.

The navy department has asked the forest service to investigate guijo, a Philippine wood, for possible use in decking boats and ships. Longleaf pine, sugar maple, and beech are the domestic woods most used for decks.

Hawaiian Gazette Co.

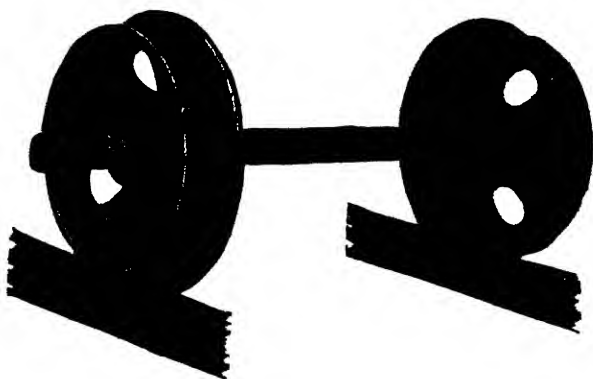
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No. 2

Divisional reports for January elsewhere speak for themselves in the showing they make of activity and progress in each case.

Some clear and compact notes on pineapple culture, being a paper by Mr. C. G. White, adds much to the value of this number of the Forester.

Prof. Silvestri's report of his expedition in Africa in search of fruit fly parasites has been issued in bulletin form. A review is deferred on account of crowded space.

Through inadvertence the Index to Volume X was not mailed with the January number. It will reach Forester readers with the present number, answering many inquiries from the islands and mainland.

In this number is begun the publication of a thesis on alfalfa, by Mr. Meinecke, a student of the College of Hawaii, with an introduction by Mr. Krauss, professor of agronomy in that institution. It will run for seven or eight months.

NOTES ON PINEAPPLE CULTURE.

Paper read by C. G. White before the Homesteaders' Association, Haiku, Maui, Oct. 18, 1913.

There does not seem to be anything in pineapple plant selection for uniformity and shape of fruit. In my experiments to this end, crown plants from cone shaped fruit, and from multiple crowned fruit growing side by side, all produced normal fine barrel shaped fruit. It is my judgment that coned shaped fruit occurs most often in the winter crop, especially on poorly prepared ground, the cause being a check to the feeding ability of the plant.

The best prepared and cultivated ground gives the most uniform fruit. The same condition also seems to have something to do with an early yellowness inside the fruit, while the outside is still green.

I do practice a rough selection, making for vitality. Sick

plants are removed from the fields and partially rotted plants are not replanted, even when enough is left. It does look as though there is something in such practice. I have a neighbor who started at the same time as I did, who planted everything. He is now buying plants from me in preference to using his own.

Thorough preparation of the soil before planting pays. If the soil is plowed several times, much harrowed, and well sunned for some months, so much the better. This sunning is particularly necessary on old ground. The second planting is very subject to rot. Sunlight kills the *Thielaviopsis* spores if it can get at them.

The plowing, after the first breaking, should be deep, but not into the subsoil, which is generally poisonous here. I have traced pineapple roots twenty inches deep in good soil. The last plowing should require little or no harrowing. The soil should be in good condition by this time from previous work on it. This plowing should just precede the planting. A test for fitness is the ease of planting. A well harrowed piece of ground, but hard beneath, should be replowed.

One effective method of loosening the subsoil is by dynamite. I cannot say it pays to use it generally, but I suspect it does. I have used it very successfully on a spot having an impervious subsoil so near the surface that water ran on top after every shower of importance. The cost is about \$17.00 an acre. One stick of 20% dynamite is placed every twenty feet, about five feet down and well tamped. I intend to use it regularly now. At least it will help deepen the soil, and that is much needed in places.

The growing of a legume to plow under greatly aids the second planting, but it must be plowed under in time to rot and in time to thoroughly work the soil—perhaps six months previous to planting is not too much. There are lots of legumes for green manuring, but some have root knot and are of questionable value on that account. There are two fine growing *dolichos* beans found wild here that are in this class. *Crotalaria*, or rattlebox weed, that grows hereabouts is the best renovator I know. Pigeon peas are good, but perhaps a little coarse.

Fertilizers so far have hardly proved worth while on the first crop, except on some backward spots. Apparently they are almost a necessity on second planting, and are profitable here on ratoons. I apply a half ton to the acre, or more, usually more, using a Planet Jr. No. 20 fertilizer distributor, but I hope for something better. I would distribute broadcast but that this method makes the detection of mealy bugs more difficult. Besides this, our climate is pretty windy for it. In Florida acid phosphate without lime is considered detrimental. On Oahu acid phosphate is recommended for manganese soils, I understand. Also in Florida certain combinations with sulphate of ammonia are condemned if not the material itself. Here in Hawaii sulphate of ammonia is usually recommended. A combination of blood, bone

and sulphate of potash is both a good and a safe mixture. Sulphate of ammonia can be mixed with this to advantage perhaps. I have some pot experiments that indicate that gypsum is a benefit on subsoil. The experiment station recommends humus, and also burning. Lime is little, if any, benefit to the crop.

I plant between nine and ten thousand plants to the acre. At present I space plants 48 inches between rows by 14 inches in the row. I have tried all ways, and think this approximately the best for horse cultivation and profits. There is little good in massed rows of any sort. They increase expense, and decrease size of fruit. If I could not use animals at all I would plant 40" x 16". As an aid to planting I have a 400-foot small cable wire marked for spaces, and held by an iron stake at each end. These stakes have an offset or shoulder so that they can be shoved into the ground with the foot like a shovel is. On one stake I use a grip so that the wire can be shortened without wrapping it around the stake. The blade of the planting mattock is 12" x 3". This is more efficient than an ordinary eight-inch grubbing hoe. The mattock man works with a mate, who slips the plant into the hole before the dirt has a chance to fill it up.

To free the new plants from mealy bugs, I use a large tub and a drain table made of a piece of corrugated roofing iron, with flaring wooden sides. At the lower end of this table is a spout, and the upper end is left open so that the drained plants may be pushed off. In my notes of seven years ago, I find that five men planted 1800 suckers a day, and I thought they were doing good work. Now five of my men plant over 4000, and quit at 2:30 p. m. The day's work when plants are not dipped, is for the gang to strip and plant per man 800 suckers, or 1000 slips, or 1200 tops, and they do this easily and well. Dipping the plants will decrease the average about fifty plants per man, not more. Suckers are planted six to eight inches deep, at least, and other plants are put as deep as practical. The effect of shallow planting is that the plant is less likely to stay thrifty. It does not pay to pack the soil about the plant except in very dry weather. This year is the first time I have ever noticed any gain by so doing.

Beginners usually strip too much. In a wet season it is little use to strip tops at all. In winter planting I leave all their leaves on; and with suckers I only remove three or four leaves up one side. The plants start a little slower. The ends of suckers are cut off only when the shank is very long or very crooked. The way to strip a sucker is to start three or four leaves up the side, and take all the rest off at one time, shucking sidewise as you do a top.

It is customary to replant two or three times, removing all plants that look badly, or that pull up easily because of shank rot, or from shallow planting. Sometimes there is an almost perfect stand. At other times there is a loss of 75%. Four or five per cent. loss is nothing to think twice about.

The best time to plant is from May 1st to October 1st. I usually begin in April and finish up in October. It does not pay to plant inferior plants. I do not sort closely to size. My practice is to plant nothing but suckers, and slips large enough to compete with suckers. In this way I save six to twelve months on the plant crop, and the harvest is prolonged. As much as half the crop comes in the off seasons. It costs more to pick scattering fruit, but there is no lazy season and no rushed harvesting. To my mind there is no crop that keeps labor as ideally employed all the year round as pines grown by this method. Suckers that are too mature quickly show a bud, these are weeded out with the sickly plants.

Many plants rot because of rough handling. The shank of a sucker must not be roughly twisted in detaching it from the parent stalk, nor should any plants be trampled. It is easy to remove suckers carefully. I allow one plant to grow two suckers to fruit, and no more at any time. To remove the surplus shoots from the parent stem, the leaf below the shoot is removed first, and the sucker is pulled outward and then sidewise. A vigorous sucker or top is good to plant; but a lush, soft one is no better for propagation than any other sort of lush plant. A dried sucker is undoubtedly more resistant to rot when planted than a fresh one. In practice I plant as soon as convenient after the picking.

The less our soils are stirred when wet enough to puddle, the better for us. As a choice of evils we often do have to hoe the crop when the soil is too wet.

The way I plant, I can horse-hoe for about nine months and again for a few times after the plant crop is off. The hoeing woman gets \$1.50 an acre per month when the horse hoe is operating and \$2.50 when she does all the cultivating herself. If the field is ridged she gets fifty cents more, as the work is increased, and our most efficient tool, a scuffle hoe, can only be used a little, since it levels the ridges too much. I do not believe in hoeing contracts based on tonnage. I have a general bonus system in which those engaged in the other important operations share. A half cultivated field gives the tonnage man too much for what he does. It works out in actual practice that the man is at something else more than he should be.

It is humane and profitable to keep the help supplied with gloves. At present I use a cloth glove, leather faced, costing 25 cents, but I hope to do better with a better glove. A pair of these lasts about three days in sucker picking, and about three weeks in other work. In the Florida fields, gloves are made of ten ounce duck. I have never been able to buy them.

The small-tooth horse cultivator is not an effective tool; as it has a tendency to work the dirt to the middle of the row, leaving the roots to be washed out by the rain. For first use in a sucker field I like a regular six-toothed cultivator, arranged to

close the outside furrows. Among tops and large plants I like sweeps—the narrow V-shaped, sharp-pointed sort. If the plants are finally left slightly ridged, so much the better. Where there is questionable drainage a big ridge is fine. It might pay to always ridge high, despite the added cost of cultivation.

The custom of having the horse led in horse hoeing is not entirely to be condemned. It is much quicker, there is less damage, and it makes for a better job generally. A pine root cut never grows again, so care is worth while. Most of the labor is so unskilled that one man to a horse hoe is impossible, anyway. When it comes to horse hoeing among large plants, the singletree should be raised up under the horse's tail, using a backband over the rump to keep it high, and a belly band to hold the traces low at the collar. With short traces this works well: and the animal gets used to the singletree touching his hams when the pull is slack. The singletree must be well above the hock or the horse will bang himself. It is surprising how long cultivation can be continued with this arrangement, and with the horse hoe equipped with large sweeps, say 1 fifteen-inch and 2 twelve-inch Planet Jr. improved sweeps. When the ground is too hard, a half bag of dirt on the horse-hoe helps hold it to the work.

So far as I know at present, an old field can be best renovated by chopping up the old plants with a heavy hoe not too much angled, followed with a weighted disc harrow to hurry the rotting. The harrow will need pressure boards, otherwise the stools will bunch up in front. A pressure board on a disc harrow is a good idea most any time.

This renovating work is best done in the winter season, as rot is most active then. I would have the stools all well rotted before plowing the land, even if the job is a long slow one. You kill the plants, save their fertility and humus, and do not sour your soil. Unrotted stools grow, if plowed under. In the near future there will be tools to do this work easily and cheaply. Killing the stools with poison sprays also has possibilities. I have just planted an old field where the plants were surface rotted, the soil dynamited, and fallowed for six months. This soil plowed finally as freely as new ground would have plowed.

Wilt seems to be a matter of heat and indigestion. It attacks the thriftiest looking plants, mainly in the lower altitudes.

Rot is on the increase and may prove a bad enemy. I have indicated the way to fight it in new fields.

The way to get rid of mice is to poison them. Take one-half cup flour, moisten with cold water, stir in one and one-half pints boiling water in which has been dissolved one teaspoonful of saccharine and one ounce powdered strychnine. Pour this over one-half bushel of wheat, stir very thoroughly, and spread to dry. Later stir in a cupful of melted tallow to waterproof it somewhat. This is a good keeping concoction that will poison twenty acres or so, a light scattering being all that is needed. It is best to re-

member that it is a poison. This is practically the same as the bait used in California to clean out the squirrels.

Mealy bugs are a great nuisance, especially in dry weather. The ants herd them like cows and keep a flock in reserve to replace losses. The way to have clean fruit is to use clean plants, and to spray, and spray. There are a lot of good sprays that concentrating round the stem of the plant injure it. Soap seems the best spray, all things considered. Ivory soap is good, and Fir tree oil soap. Good's Caustic Potash Whale Oil Soap No. 3 is the best I know anything about. Being a soft soap it is easily dissolved, the potash is a fertilizer and it can be laid down here in barrel lots at less than six cents a pound. Made by James Good, Front street, Philadelphia. Most dealers palm off a caustic soda whale oil soap on the buyer, which is not so good, though it is equally smelly and cheap. Most soap sprays need about one pound soap to seven or eight gallons of water for mealy bug work. Fir tree oil soap, costing about thirty cents a pound, and caustic potash whale oil soap are effective somewhat more diluted.

The most effective use of a spray requires pressure, more than can be got out of a knapsack sprayer. Otherwise the Deming Co.'s knapsack spray pump, which has a drip collection to protect the bearer's back, is a good machine. It needs a nozzle that sends the spray in a rather compact stream—a broad spray for this work is weak and wasteful. What is called the auto-pop nozzle is very good when altered a little, and it is saving in soap. Where possible I use a wheel barrel spraying machine that gives 100 pounds pressure. There are many so-called auto-spraying machines on the market. I have tried a number and never have seen a decent one. With these machines, you pump up pressure before spraying. The scale is easily controlled by soap. Vigorous plants suffer little from it.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, Feb. 24, 1914.

To the Honorable the Board of Commissioners of Agriculture and Forestry.

Gentlemen:—Pertaining to the work of the Division of Animal Industry during the month of January, 1914, I have to say that I have been confined to my room for a considerable part of the time on account of sickness. Inspection of imported live stock as well as tuberculin testing has been carried on as usual by Dr. Case while I have devoted myself to my annual report and to the dog quarantine station, which I have managed to visit regularly. I would only call the Board's attention to the recommendations in my last reports as to the keeper's cottage and an additional small building for the safe keeping of fancy dogs. This I believe is essential. As may be seen from the enclosed corre-

spondence with Governor Pinkham every effort is being made to discredit or belittle the importance of the dog quarantine with a view to its abolition or at least modification to quarantine on the premises. So long as this feeling prevails it is necessary that every possible step be taken to guard the animals while in quarantine and it has been found necessary of late to have a man sleep in the dog enclosure every night.

That rabies is in no way abating on the mainland will be seen from the accompanying copy of the Hayward Journal (California) under the heading, "Mad Dog Bites Six People" (Jan. 27, 1914), and which is only one of many similar cases which have been reported to me recently. The dog in question bit not less than twenty other dogs and as a number of these undoubtedly were strays or ownerless dogs that will not be apprehended, some of them will in due time develop the disease and repeat the performance of the dog in Hayward. From the graphic description of this one outbreak it may easily be imagined what the introduction of a single infected dog into this community might mean.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Jan. 31, 1914.

Dr. Victor A. Norgaard, Superintendent of Animal Industry.

Sir:—I have the honor to submit herewith my report for the month of January, 1914:

Tuberculosis Control.

The fifth annual tuberculin test of the dairy herds of the City and County of Honolulu was started this month and the following animals have been tested:

	T.	P.	C.
C. K. Quinn.....	3	2	1
W. E. Wall.....	1	1	0
Tom Quinn.....	3	3	0
P. M. Pond.....	129	125	4
P. M. Pond.....	308	307	1
F. S. Lyman.....	29	29	0
Waialae Dairy.....	231	221	10
Waialae Dairy.....	178	177	1
Waialae Dairy.....	3	3	0

This number makes a total of 885 head tested, out of which number 868 passed and 17 condemned and branded. Post mortem

examination on the heifer condemned at C. K. Quinn's dairy revealed generalized tuberculosis. Out of the five cows condemned at the Pond Dairy and which were killed at the Waipahu slaughterhouse, I was only able to make examinations on two, but in these two the disease was present in a generalized condition, which made the carcass unsafe for human consumption.

These two cows together with one which was killed the previous day were purchased by Mr. Pond from Mrs. C. M. White's dairy which, on two separate tests, had shown 50% of tuberculosis. The six cows, which formed the original purchase from Mrs. White, have now all been condemned and slaughtered.

Importations of Live Stock.

Jan. 5—S. S. Siberia, Orient: 1 black chow dog, J. Morton Riggs.

Jan. 10—S. S. Chiyo Maru, Orient: 28 crates pheasants, E. H. Paris.

Jan. 13—S. S. Lurline, San Francisco: 20 crates poultry.

Jan. 20—S. S. Wilhelmina, San Francisco: 14 crates poultry.

Jan. 26—S. S. Alaskan, Seattle: 11 horses, 13 mules, G. Schuman.

Jan. 28—S. S. Honolulan, San Francisco: 5 horses, D. Ferreira: 3 boxes monkeys, 5 boxes white mice, U. S. Exp. Station; 24 crates poultry.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, Jan. 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work of the Division of Entomology for the month of January, as follows:

During the month 29 vessels arrived at the Port of Honolulu, of which 27 carried vegetable matter and 2 moulding sand.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	963	22,998
Fumigated	14	1,144
Burned	102	128
Returned	2	2
Total inspected	1081	24,272

Of these shipments 24,005 packages arrived by freight, 117

packages by mail and 150 packages as baggage of passengers and immigrants.

Rice.

During the month 33,940 bags of rice arrived from Japan, all of which was found free from pests and was passed for delivery.

Pests Intercepted.

Ninety-one lots of fruit and 7 lots of vegetables were found in the baggage of passengers and immigrants from foreign countries and being prohibited from entry were seized and destroyed by burning.

One box of Chinese Pomelos arrived from the Coast on the Honolulu. This fruit was in the original package as shipped from Hong Kong, had found its way to the Coast, where it had been admitted, and then shipped here for Chinese New Year. As such fruit is prohibited from entry into the Islands it was seized and destroyed by burning.

A package containing sugar cane from Formosa was held for inspection at the U. S. Post Office. Under the new parcel post ruling the package was ordered returned to the shipper, for no plants or parts of plants can be shipped into the United States by parcels post from foreign countries. This ruling will also include bulbs and seeds.

In the grass packing about a shipment of plants from the Coast were found some ants (*Taminoma scssile*) and five species of beetles as yet undetermined. It is my opinion that these insects had taken refuge in the packing material during the cold, damp weather which prevailed on the Coast during the month.

Four baskets of sweet potatoes from Hong Kong were badly infested with the larvae of *Omphisa anastomosalis* and *Cylas formicarius*, two of the most common sweet potato pests. This was the worst lot of infested material I have ever seen, samples of which are in the Division Museum. In the same lot a colony of ants (*Prenolepis longicornis*) had established itself. The four baskets were first fumigated with Carbon bisulphide and then burned.

A box of seeds from Manila arrived by mail and contained a large colony of ants (*Prenolepis longicornis*). It is interesting to note that of the many species of ants which are found in all kinds of materials, not only in plant shipments but also in general cargo, very few species become established, despite the fact that well established colonies have been found during our inspection work, and no doubt previous to that must have been coming into the Territory. The small yellow house ant (*Monomorium pharaonis*) and the long horned black ant (*Prenolepis longicornis*), both found on these Islands, are also present on nearly every steamer as a pantry pest.

Hilo Inspection.

Brother Matthias Newell at Hilo reports the arrival of five steamers and two sailing vessels, the five steamers carried vegetable matter consisting of 122 lots and 2294 packages. One hundred sacks of potatoes had to be cleaned before delivery and some scabby ones rejected. Two cases of turnips and one of parsnips were so dirty that it was impossible to inspect them and they were returned to the Coast.

The T. K. K. steamer Anyo Maru arrived at Hilo direct from Japan during the month and brought 630 bags of rice, 588 bags of beans and 4 bags of sesame seed, all of which was passed as free from pests.

Inter-Island Inspection.

During the month of January 56 steamers plying between the Islands were attended to and the following shipments were inspected:

Passed as free from pests:

Plants	76	packages
Taro	1091	"
Vegetables	35	"
Fruit	12	"
<hr/>		
Total	1214	"

Rejected on account of pests and soil:

Plants	9	packages
Fruit	13	"
<hr/>		
Total	22	"

Respectfully submitted,

E. M. EHRLORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, Jan. 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the routine report of the Division of Forestry for the month of January, 1914:

Forest Fences.

The completion of two forest fences, built under contract for the Board at Moloaa, Kauai, and Makawao, Maui, may well re-

ceive first mention this month in that they are the initial fencing projects to be done under the new law giving the Division of Forestry the use of half of the revenues from water licenses.

The fence at Moloaa is on the boundary of the Moloaa Forest Reserve and continues other new fences required under Government leases of adjoining land. By means of them, with other fences already existing, the whole mauka section from the Anahola Ridge to Kalihiwai is now protected from cattle. As there are a number of small valleys carrying water in this reserve the effective protection of the slopes is a matter of no small importance. With the hillsides draining into these valleys protected it is reasonable to expect that more dependance can be placed on the streams as sources of local water supply. The fence at Makawao, Maui, encloses the area adjacent to the Waihou Spring, one of the very few permanent sources of water on the western slope of Mt. Haleakala.

On January 26, in response to a call for tenders, bids were received and opened for the construction of two more forest fences—respectively at Ninole, Kau, Hawaii, and at Lualualei, Oahu. The Ninole contract was awarded to Chas. H. Will of Hilo, the lowest bidder. All the tenders of the Lualualei job were rejected as being too high in cost. Other arrangements are, however, being perfected, under which it is expected that this latter fence will be built.

Several matters in connection with Government lands in the Honolulu Watershed Forest Reserve, Oahu, referred to me during the month, have received attention and will be reported on to the Board in the near future. With the regular routine work of the office the investigation of these questions has occupied most of my own time during the latter part of the month.

Forest Fire at Luakaha.

On January 26, a forest fire was reported in Nuuanu Valley, on Government land on a spur of the Pacific Heights ridge, just mauka of the C. M. Cooke place. It was discovered by Mr. L. A. Moore of the Waterworks Department, who began the fight. Chief Thurston of the Honolulu Fire Department sent a squad of men who worked hard to put the fire under control. David Haughs, with men from the Government Nursery, completed the work and stayed to patrol the area until all danger was past. I am indebted personally to Mr. J. C. Dort of the Division of Hydrography for taking me up to the fire on his motorcycle.

The area burned over is on a steep-sided ridge, that was covered below with dry grass, higher up with staghorn fern, and above with Koa trees and ie-ie vine. The fire was put out in the Koa grove, some trees being killed. About ten acres all told were burned over. It is not known how the fire started, but the evidence seems to point to a cigar or cigarette butt dropped by some-

one in the dry grass in a side gulch near the main stream at the foot of the ridge.

Work at the Nursery.

The routine report of the Forest Nurseryman, transmitted herewith, gives details in the matter of plant propagation and distribution and of the tree planting work now in progress on Mt. Sugar Loaf, Tantalus.

From the sub-nursery at Hilo Brother Matthias Newell reports the distribution of 1066 trees during 1913. He says, "The showing is not quite as good as the years before but this is owing to the fact that it is not always possible to fill demands for certain trees, there being not enough on hand." Now that the extension of the Hilo Railroad brings so much more country within easy reach of Hilo, this sub-nursery will doubtless have many more calls made upon it. Any homesteader or landowner in Hilo or Hamakua who desires trees can get them by making application to Brother Matthias Newell and paying the cost of transportation.

Congressional Seed.

A new lot of Congressional vegetable seed was received in January from the Delegate to Congress. As usual it is being distributed through the schools and to individual applicants. While it lasts packages will be sent to anyone who applies. There is this year no flower seed available for general distribution.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, Jan. 31, 1914.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of January, 1914:

Nursery.

Distribution of Plants.

	In boxes transplanted	Pot grown	Total
Gratis	250	116	366
Sold	720	577	1297
	<hr/> 970	<hr/> 693	<hr/> 1663

Collections.

Collections on account of plants sold amounted to.....\$ 4.40

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 9200 in seed boxes, 4500 in transplant boxes, and 1100 pot grown. Total 14,800.

Makiki Station.

An extra man was taken on at the beginning of the month, his work being to attend to the introduced plants which we are continually raising from seed received from foreign countries. The other two men have been doing regular routine work, namely mixing and sterilizing soil, transplanting trees, etc.

Honolulu Watershed Planting.

An extra man was taken on at the beginning of January, which makes five men altogether now employed. The number of trees planted during the month amounted to 1100, previously planted, 986. Total planted at the end of January 2086. Other work done consisted of clearing lines and making holes. The trees that have been planted are doing well and promise to make a rapid growth.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

 DIVISION OF HYDROGRAPHY.

Honolulu, February 10, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography for the month of January, 1914, is submitted:

New Stations.

During the month of January twenty-three new stations were established and five were discontinued, as follows:

<i>Island</i>	<i>Established</i>	<i>Discontinued</i>
Kauai	1	3
Oahu	18	2
Maui	4	0
	<hr/>	<hr/>
Total	23	5

Of the above, the five stations established on Kauai and Maui are Stevens clock register stations, and the eighteen on Oahu staff gage stations.

The three stations discontinued on Kauai were ditch stations, which had served their purposes. The two stations discontinued on Oahu were on the Lulumaha and Pauoa streams. Three stations were not giving reliable results.

Reconnaissance Work on Oahu.

A considerable part of the month was spent in making the reconnaissance of the water serving valleys of windward Oahu. All streams from, and including the Honolulu basin, around the island counter-clock-wise as far as the Kahaluu valley are now under investigation. In addition to these, stations are being maintained on the Waiahole stream at a low level, and on the two branches of the Kaukonahua on leeward Oahu above all diversions.

Station sites have been selected on the streams in the Kahaluu, Waihee, Kaalaea, Waianu, Waikane, Kahana, and Punaluu valleys during the month. The Waiahole Tunnel project will pick up all of the low water discharge of the Waiahole, Waianu, Waikane and Kahana streams at an elevation of about 750 feet above sea level. At this elevation the streams are broken into many feeders, and the cost of establishing and maintaining a station on each stream above the proposed tunnel intakes would be excessive. The water company will probably maintain sufficient discharge measurement stations on the tunnel line to determine the amount diverted from each valley. The present station on the Waiahole and the proposed stations on the Waianu, Waikane, and Kahana streams below the tunnel line will determine the run-off from these valleys, which is not diverted.

Molokai Reconnaissance.

On February 10 C. T. Bailey and the undersigned will go to Molokai to make an extended reconnaissance of that island. The officials of the American Sugar Company of that island have agreed to provide all transportation facilities.

1913 Progress Report.

The assembling and computation work in connection with the 1913 Progress Report was about ninety per cent completed on January 31. The work has been somewhat retarded by the delayed receipt of field data from Kauai. The construction work on Kauai and Maui was not suspended during the month and interfered to some degree with the work of getting field data into this office.

1912 Progress Report.

On January 29 the galley proof of the 1912 Progress Report was received, and is now being proof-read in this office.

G. K. Larrison, Superintendent.

The entire month was spent on Oahu. One miscellaneous measurement was made, and les reconnaissance were made of the Kahaluu, Waihee, Kaalaea, Waianu, Waikane, Kahana, and Punaluu valleys with J. C. Dort, office engineer. Clock registers will be established on the Waikane, Kahana, and Punaluu streams in the month of March. The balance of the month was utilized on general administration work, computation and estimates pertaining to future construction, and the 1913 Progress Report.

J. C. Dort, Office Engineer, Oahu.

Mr. Dort visited four stream gaging stations and one rainfall station, spent 20 days in the office on the 1913 Progress Report and seven days in the field. He accompanied the superintendent on les reconnaissance of the Waianu, Waikane, Kahaluu, Waihee, Kaalaea, Kahana, and Punaluu valleys.

C. T. Bailey, Assistant Engineer, Maui,
H. Kimble, Assistant Engineer, Maui.

Mr. Bailey spent almost the entire month in collecting Maui data for the 1913 Progress Report, and working on the same in the Honolulu office.

Mr. Kimble spent the entire month on the construction of the new clock register stations in the Alo, Halawaliili, Halawanui, and Iionopou streams on East Maui.

W. V. Hardy, Field Assistant, Kauai,
D. E. Horner, Field Assistant, Kauai.

Mr. Hardy spent the first part of the month on leeward Kauai collecting rainfall data, and collecting and preparing data for the 1913 Progress Report. The station on the Hanalei stream was completed during the latter part of the month. The construction work on the Kalihiwai station was also started.

Mr. Horner spent the entire month on construction on the Hanalei and Kalihiwai stations.

The heavy winds of the early part of the month did considerable damage by blocking trails with fallen trees.

Mr. Hardy spent 20 days in the field, and Mr. Horner 29 days. Thirteen stream measurements were made, and sixteen rain gages were visited.

H. A. R. Austin, Field Assistant, Oahu.

Mr. Austin spent 3½ days in the field and visited three stream gaging stations on one rainfall station. The balance of the month was spent in the Honolulu office on computations, map tracing, etc.

G. R. White, Field Assistant, Oahu.

Mr. White spent 18 days in the field, established 18 stations, constructed eight weirs, visited 19 stations, and made 29 measurements. The balance of the month was spent in the Honolulu office on computations, estimates, and general office work.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

THE KALO IN HAWAII (VIII).

By VAUGHAN MACCAUGHEY and JOSEPH S. EMERSON.

THE WET-LAND CULTURE OF KALO (Concluded). FERTILIZERS.

All fertilizers should be applied before planting. Under most conditions the best fertilizer for upland or unirrigated taro is stable manure. The Hawaiians were familiar with the use of burnt bone as fertilizer, calling this material *pela*.

Mr. F. A. Clowes, with the Federal Station, finds that a rather liberal application of lime (1000 lbs. or more per acre) increases the yield and checks the rot disease. A satisfactory fertilizer for irrigated kalo consists of 300 lbs. ammonium sulphate, 450 lbs. superphosphate, and 400 lbs. sulphate of potash per acre.

Some very illuminating fertilizer tests with kalo have been carried on by the Federal Agricultural Experiment Station, and these are reported as follows:

* "In August, 1910, the station began some fertilizer tests on taro to determine the relative economic value of the use of fertilizers in various proportions and mixtures. These experiments were made in conjunction with the Kalihi Poi Factory and upon their taro plats. These experiments have been completed, and the data accumulated therefrom present some results of considerable practical value to taro growers, and in addition are of some scientific value.

"The field was divided up into seven plats, each approximately one-twentieth of an acre in area. The fertilizer was applied on

* Hawaii Agric. Expt. Sta. Ann. Rept. 1912.

August 5 and the taro planted on August 15. To plat No. 1 superphosphate and sulphate of potash were added; to No. 2, nitrate of soda, superphosphate, and sulphate of potash; to No. 3 no fertilizer was added; No. 4, ammonium sulphate, superphosphate, and sulphate of potash; and No. 5 received ammonium sulphate only. The same fertilizer was applied to plats 6 and 7 as to No. 4 except that in the case of No. 6 it was applied on September 16, just before planting, while on No. 7 it was applied two months after planting in order to determine if the time of application would cause any great variation in results.

"On August 29th the plants in plat No. 2 appeared to be about twice as large as the check plat; in plat 1 they were smaller, while in 4 and 5 they were about the same size as in the check plat. On September 12 the plants in plat 1 had assumed a yellowish color and were still smaller than those in the check plat. In plat 2 they were still larger than the check plat, but also very yellow. Plats 4 and 5 at this date showed great improvement, and the plants were larger than in any of the plats and of better color, No. 5 appearing especially green. The final results of the experiments are shown in detail in the following table:

EFFECT OF VARIOUS FERTILIZERS ON TARO.

No. of Plat.	Fertilizer Applied.	Amount per Acre. Pounds.	Yield of Taro. Pounds.	Yield of Poi. Pounds.	Pctge. of Poi in Taro.
1	{ Superphosphate..... Sulphate of potash.. }	{ 450 450 }	1499	1050	70.0
2	{ Nitrate of soda.... Superphosphate..... Sulphate of potash. }	{ 400 450 400 }	1751	1010	57.6
3	No fertilizer.....	...	1231	920	74.7
4	{ Ammonium sulphate Superphosphate..... Sulphate of potash. }	{ 300 450 400 }	1702	1270	74.6
5	Ammonium sulphate	300	1215	900	65.8

"These experiments, while they were carried through only one season, indicate the economic value to be derived from the application of ammonium sulphate, superphosphate, and sulphate of potash to taro. In the second column are shown the weights in pounds per acre, the plats used being only one-twentieth of an acre in size; hence only one-twentieth of these weights were applied on each plat. The yields of taro and poi are given in pounds per plat and not in acreage figures. The weight of taro does not include leaves, but only the marketable root bulbs. Column 5 represents figures obtained in factory.

"It is clearly evident from these results that the effect of nitrate of soda is to produce a bulb of greater weight and volume than any of the other fertilizers, but in so doing it causes a decrease in

carbohydrate content, from which some doubt arises as to its economic value as a fertilizer, even though it produced 90 pounds more poi than the check plat. The mixture used in plat No. 4, namely, ammonium sulphate, superphosphate and sulphate of potash, while it produced an increased yield of 350 pounds poi more than the check plat, does not produce an abnormal growth of the plant as in plat No. 2. This is shown by the fact that there is only 0.1 per cent. difference in the percentage of poi in taro obtained from this plat and the check plat, which indicates the normal development of carbohydrates in the root bulb, which results are to be desired in all fertilizer applications.

"The fact that taro is grown under soil conditions similar to those in which rice is grown suggests the possibility of these plants having the property of assimilating nitrogen in a somewhat similar form. It has been shown* that rice is unable to properly assimilate nitrogen when added in the form of nitrates, while, on the other hand, ammonium sulphate supplies the nitrogen in a form which produces a considerable increase in yields of both straw and grain. However, in the case of taro the nitrate produces a slightly larger root than the sulphate of ammonia, but less starch.

"Plats 6 and 7 showed practically no difference in yield, indicating that no difference results from delaying the application of the fertilizer for two months. Also, the yield of these plats was practically the same as that from plat No. 4."

PLANTING.

Before planting, the water is run off, leaving a soft muddy surface. Sometimes, after the bottom of the kalo patches has been pounded, soft, loose dirt is spread over the surface, preparatory to planting. This is called *mahelu*.

The *huli* are the cuttings that are used for the propagation of the taro. They are of three types—*huli makua*, *huli ohá*, and *huli pu'u*. *Huli* is a generic term for those portions of the kalo that are used in propagation.

The *huli makua* is made by slicing off the top of a mature corm, the slice bearing with it the crown of leaves. The petioles are cut some eight or twelve inches from the slice, leaving these long stubs (*laupa'e*) of the petioles attached to the slice. In the midst of these petioles are the young leaves, so that this type of *huli* is really a large terminal bud, with a portion of the starchy stem or corm attached. To insure growth, the *huli* should be cut with a thin slice of the corm attached. If it is cut off without this precaution, the *huli* rots in the ground and will not grow kalo. Such a carelessly-cut kalo top is called *huli omu'omu'o*, and is a re-

* Hawaii Sta. Bul. 24.

proach to the planter. The *huli makua* is the part commonly planted by the Chinese taro raisers.

Concerning the *huli makua*, Mr. Clowes writes: "The percentage of *huli omu'omu'o** which produce blossoms as the first step in their growth after planting, is large. As the initial stages of growth have great influence on the future of the crop, it is probable that the energy lost by the *huli omu'omu'o* in producing these useless blossoms, lowers their value as seed. However, it is the generally accepted belief that vigorous *huli omu'omu'o* are fairly good seed. It is common and advisable practice, however, if the *huli omu'omu'o* has divided into two branches preparatory to blossoming, to remove the flower branch before planting. It is also a commendable practice, when the blossoms appear after the *hulis* are planted, to remove them. They are an excellent vegetable when boiled, and for thus purpose alone are worth picking."

The *huli ohá* are lateral cormlets or suckers that are produced at one side of the main corm, and bear crowns of leaves. There are frequently a number of these cormlets grouped around the central corm. The *huli ohá* produce flowers more rarely than do the *huli makua*. Mr. Clowes finds that "large *huli* from *ohá* are vigorous, and probably better than *makua* of the same size."

In a letter from Mr. Clowes (June 18, 1912), the following statement is made: "As to the following habits of the taro, it is my observation that the only *hulis* that produce inflorescence are the *makua* *hulis*. In an experiment on the Hilo Experiment Station plots, out of 1000 *ohás* planted, only two flowers were recorded, and I think that must be due to a mistake somewhere. The production of the inflorescence in the *makua* *hulis* was very profuse * * * It is my impression that every *makua* produces flowers. I do not think *ohás* ever do so, but this point I intend to determine by accurate observation. Sometimes in the upland taro fields, near the time of maturity, inflorescence will occur. It is my impression that this is only on the *makua* part of the plot."

The *huli pu'u* are secondary lateral cormlets, too small to cook, and not yet producing leaves. The *pu'u* are the "grandchildren" of the parent corm, for they originate from the *ohá*, rather than from the *makua*. The *pu'u* are also called *weli*, *wá'e*, and *a'e*.

Ac, without the glottic closure, means the liquid or juice that can be wrung from the kalo, etc. *A'e*, with glottic closure, the lateral offspring of the second generation from the kalo corm by budding; also called *pu'u* or *huli pu'u*. These two words, *ac* and *a'e*, are absolutely distinct in etymology as well as meaning. The term *a'e* as applied to the secondary offspring of the kalo is only used with respect to upland kalo; *pu'u* is the word used with re-

* The name *huli omu'omu'o* is in some regions erroneously used as synonymous with *huli makua*.

spect to the same thing in wet-land kalo. A native from Molokai calls the juice from the kalo stem, *wale*. The same man calls the offspring of the second generation of the wet-land kalo, *wa'a*. These huli *pu'u* are very satisfactory for propagation, for although they grow at first more slowly than the *huli makua*, they ultimately grow more rapidly. This is due to the fact that in the *huli makua* only a small slice of the corm is left attached to the *huli*; while the *huli pu'u* possess entire corms. The *pu'u* are therefore the quickest of all, giving a crop, in many instances, within six months from planting.

TIME OF PLANTING.

There is considerable divergence of opinion among the present-day Hawaiians as to the best time for planting the *huli*. According to some, there are two periods in the course of the Hawaiian lunar month that are considered especially propitious for the planting of kalo—the nights of these two seasons are *hoku* and *mahe-alani*. These are during the first quarter, when the moon is waxing. Others designate three suitable occasions—the two above mentioned, and also a third period, *akua*. According to other reliable authorities, the *huli* may be planted at any season, irrespective of the condition of the moon. In this case, however, when the moon is full, the planter must go into the field or *lo'i*, and press the mud firmly around each *huli*, so that they are firm in the mud. This causes the corms to attain large size; if omitted, they will be small and stunted. These ideas are, of course, wholly superstitious.

METHOD OF PLANTING.

The *huli* are planted either in rows or in hills. The planting or thrusting of the *huli* into the mud is called *kanu huli*. *Kanu* is a general word, meaning to bury in the earth. Kalo growing in hills is called by various names, as *opu kalo*, *pu'e*, or *pu'epu'e*. Five or more *huli* are planted in a single hill. When *huli* are scarce, economy may compel the reduction of the *huli* in a hill to four. Ordinarily five or more, and sometimes, in an extra large hill, as many as ten or a dozen, or even twenty, may be planted.

Planting in hills was customary among the Hawaiians; planting in rows, because of the larger returns per acre, finds favor among the Chinese planters. Kalo planted too closely in hills or rows was called *pipipi* or *ku-pina'i*. Kalo recently planted is called *op'e-ape'a*. The evolving or unfurling of the leaf is called *mohala* or *mohola*; the first leaf to appear after the *huli* is planted is *lau awa*, and the first two leaves are *lau pa'i*. When *huli* are planted in rows, the rows are one to three feet apart, according to variety. Small temporary ditches containing water are commonly left between every five or six rows.

IRRIGATION.

The general water supply is not turned into the field until the plants are well rooted and the leaves have begun to unfold. If flooded too soon there is double danger—either that the plants will tip over, due to insufficient rootage, or that the tender plantlet will be attacked by root rot. Just before flooding, when the plants are three weeks to a month old, the patch is cultivated between the rows. The water is then turned in, and the field is kept continuously under water from this time until the time of harvesting.

It is highly important that the water be kept in continuous circulation. This checks the breeding of mosquitoes, and the development of root rot, and tends to produce a uniform stand. The inlet and outlet of the flowing water in each field should be arranged that the flow will be as uniform as possible over the entire area. A common yet most unscientific arrangement is one whereby the water flows across one side or one end of the patch and remains stagnant in the remainder. Under such conditions the stand will not be uniform, and there is great danger from root rot.

CULTIVATION.

During the first six months weeding is done. This is hand labor. The weeds and dead kalo leaves are trampled into the ground as fertilizer. After the first six months no more weeding is done, as there is liability of injuring the kalo. The corm remains comparatively small for a period of eight or ten months, the leaves being the rapidly growing portion of the plant during this period. Thriftily-growing kalo, full sized and good, was called *ai-ohaha*. During the last month or two the corm fills out rapidly, the other parts of the plant contributing their strength towards the growth of the corm. The vigorous and rank growth of the kalo leaves, preceding the maturity of the corm, was called *ohaha* or *ai ohaha*. The final development of the corm, which was marked by the cessation of growth in the leaves, was called *hachu*. These words are adjectives or adverbs, not substantives. Sometimes the young kalo plants were bent away from the old ones, in order to give all room to grow. This process was called *oha-kula'i*.

HARVESTING.

The growth of the kalo corm is quite different from that of such a root as carrot, which grows downward from the depth at which the seed is planted. The kalo corm is a true stem, and forms at a point not lower than the bottom of the *huli*. It then grows *upward*, and enlarges, the older leaves and roots gradually dying. The maturing of the corm can be recognized by the yel-

lowing and curling-up of the leaves (*ponalo*). The time required from planting to harvesting is from six to fifteen months, varying with the variety and the environment.

The harvesters go bare-footed in the patch, trample around the corms to loosen them from the mud, pull them by hand and toss them into piles along the embankments. The small refuse taro (*pālili*) is thrown upon the side of the patch (*hoomahahā*). The general litter about the harvested field is called *la-cle*, and the empty field itself, with the young shoots remaining, is *aa'e* or *nanai*. On the embankments they cut off the leaves, and may throw them into the patch for fertilizer or carry them away for swine food. The *huli* are then sliced off, and piled nearby. These kalo tops are called *anihinihi* or *onihinihi*. When they are dry they are *la-cle*. The corms are carried away to be made into poi, or to be sold as vegetables. If the kalo is to be marketed as a vegetable, the *huli* are not cut off. Several corms are tied together, forming a bunch. A bunch of kalo corms is called *hui-hui-kalo*.

Mr. Clowes finds that for the best results not more than two crops of kalo should be taken from the land without planting to some other crop, such as bananas or a forage crop. A very satisfactory rotation scheme, practiced on the farm of the Hilo Boarding School, is as follows: First year, kalo; second year, sorghum, cow peas, pigeon peas, vegetables, etc.; third year, cow pasture; fourth year, kalo again. This system completely rids the fields of kalo rot.

DRY-LAND CULTIVATION.

The following explicit directions for the raising of dry-land, upland or unirrigated kalo have been condensed from a statement by Mr. Clowes, who has charge of the agricultural work at the Hilo Boarding School:

The land is plowed, covering any weeds, grass or crop-refuse that is on the land. "Hilo-grass" sod is excellent ground on which to plant taro, although it may follow any crop which has not depleted the humus content of the soil.

Plowing is followed by thorough harvesting. The disc and the drag-harrow are used by Mr. Clowes. At this stage lime is applied, in the form of either coral sand, slaked or quick lime. A month after plowing the sod should have become sufficiently decomposed to permit planting. A light application of stable manure and commercial fertilizer is made at this period.

The strip to be planted is again harrowed to mix the manure evenly through the soil. The furrows (from 40 to 48 inches apart, such as are made to plant sugar cane) are opened. Whenever possible, the rows are run the longest way of the field. The bottoms of these furrows are widened, with a hoe, to prevent the

soil on the ridges from falling in on the *hulis*. For the same reason the tops of the ridges are flattened. The bottoms of the furrows are about six inches below the ground level. They are softened to a further depth of 3 to 6 inches with a hoe. Stable manure is sprinkled in the bottom of the furrow and mixed with the soil by means of a cultivator.

A boy passes along the furrows with an armful of *huli*, dropping them in pairs about one foot apart. The planter follows with a dibble, and "dibbles in" the *huli*, inserting the bottoms of the *huli* two or three inches under the ground. By pointing the *huli* to the north the sun is not so liable to injure them.

Planting is usually done after a rain, or during cloudy weather. It was formerly a common practice to spread grass, banana leaves, or any similar material on the hills or rows, to serve as manure and as a mulch. This process was known as *po'i-kalo*.

About a month after the *huli* are planted the field is hoed. As soon as the plants have developed two or three leaves, cultivation with a one-horse cultivator is begun. The cultivator frequently knocks lumps of dirt down upon the plants. Someone follows the cultivator and removes these clods. Cultivation needs to be frequent or else not at all. At the Hilo Boarding School the *kalo* fields are cultivated every week or ten days till the crop is nine months old. When cultivation is persisted in as frequently as this, roots do not form within the depth of soil stirred by the cultivator. No harm is caused by the cultivator. If the field remains uncultivated for three weeks or a month, the roots develop near the surface of the soil. In this case cultivation cuts off many roots and harms the crops.

If the field is cultivated frequently, and hoed about once a month, the weeds are easily kept in check. Small *kalo*, stunted by weeds, is called *kokolo*. At each hocking, in the earlier stages, some of the earth that the cultivator has banked around the plants is drawn back upon the ridge. By the time the *kalo* is five or six months old the ground is flat, and after this the cultivator is made narrower. At each hoeing a little soil is banked up around the taro. By the time the crop is nine months old (the exact time depending upon elevation above sea and similar factors), the *kalo* is on a slight ridge. Now the cultivation is stopped, and the weeding is confined to shallow hoeing and hand-pulling.

After the *kalo* begins to ripen it is left strictly alone. No harm results if the weeds do come in as the *kalo* foliage dies down. Weeds apparently prevent the hasty ripening of the crop. After pulling the *kalo*, the weeds are plowed under.

(To be Continued)

ALFALFA GROWING AT THE COLLEGE OF HAWAII FARM.

INTRODUCTION.

The Department of Agriculture of the College of Hawaii recognizes the importance of crop demonstration and farm practice as an aid to agricultural instruction. Consequently a systematic effort has been made to establish at the College Farm cultures of representative crops. Among the crops thus far grown none have served a more useful purpose, nor excited greater interest among students and visitors than have the Alfalfa plots.

In the fall of 1912 the Junior Class projected an extensive series of alfalfa experiments. An acre of suitable land was set aside for the purpose. This was sown to four standard varieties. Careful records were kept by all the students and much interesting data secured.

The paper that follows, "Alfalfa, A Promising Forage Crop for Hawaii," was submitted as a thesis as a partial requirement for the degree of Bachelor of Science in Agriculture by Mr. William H. Meinecke of the Class of 1913.

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Professor of Agronomy, College of Hawaii.

ALFALFA.

Medicago sativa—I.

A Promising Forage Crop for Hawaii.

HISTORY AND DISTRIBUTION.

The alfalfa or lucerne plant is believed to be a native of the temperate regions of Western Asia, most likely the northwestern frontier of India and Media.

Though the records of its first domestication are vague, it was apparently well established in agriculture before the earliest records of Greek history; but whether it was first domesticated by the Persians (as the Greeks supposed) or was used earlier farther east it is not known. The uncertainty as to the identity of the wild species from which the cultivated one developed, added to the fact that the botanical name was first given to the domesticated plant and has never been associated with any wild species makes it even more difficult to trace its origin.

It was cultivated in China at a very early date and carried to Greece during the Persian Invasion of 490 B. C. and by

146 B. C.¹ (some say 470 B. C.²) it was well known to the Romans under the name "Herba Medica," which refers to its Persian or rather its Median origin, but does not explain whether it was brought by the Romans directly from Asia. The Romans rightly prized it as a forage crop and introduced it wherever they went. There is still a little uncertainty as to whether or not it is indigenous to northern Africa, and was carried eastward along the ancient caravan routes. However, it was undoubtedly cultivated there nearly or quite as early as in Italy and was one of the favorite plants of the Sahara oases, having been grown from time immemorial.

The Moorish invasion of northwestern Africa and Spain carried the plant and name into Spain—hence the Spanish name "alfalfa" or "alfacfacah"³, meaning "the best kind of fodder." (Another theory is that the name al-falfa⁴ was derived from the Spanish *al* and the Arabic "fazfazah" which means "a certain plant used for fodder.")

During the Middle Ages it was popularly known throughout France, Belgium, Germany and England as "lucerne" (luzerne, luserne, lucern), a name which was probably derived from a river valley in northern Italy.

During the exploration and colonization of America, the English and Western European colonists carried the plant and the name lucerne to Eastern North America, while the Spanish explorer Cortes carried it in 1519 under the name alfalfa to Mexico and South America. It did not reach Peru and Chile till somewhat later and was carried as far west as Utah by the Mormon pioneers in the middle of the nineteenth century.

It was tried in New England and the North Atlantic States 150 years before the Revolution and although Thos. Jefferson (1793) and others spoke highly of lucerne, it did not prosper because of the general lack of lime and the proper bacterial organisms in the soil and also because the people were not familiar with the peculiarities of the plant. On the other hand, it was well adapted to certain parts of Central and South America and the name alfalfa spread rapidly throughout those countries, and was carried northward by the Spanish settlers along the Pacific Coast to Southern California. After the discovery of gold in that state, it was introduced from Chile in 1853 or 1854 and again in 1873 to the San Joaquin Valley, where it has become the most important forage crop of the region.

The wonderful success of alfalfa in California caused a "revival of learning" in agriculture and in spite of the determined declarations of the eastern farmers that "alfalfa was all right for the west, but was of no use and could not grow well in the east,"

¹ U. S. D. A., B. P. I. Bul. 181.

² U. S. D. A., B. P. I. Bul. 150.

³ U. S. D. A., Bureau of Plant Industry, Bul. 181.

⁴ "Forage and Fiber Crops in America"—Hunt.

it spread quickly throughout the west and has recently reached the eastern states and is now cultivated there with success and profit.

In 1895 alfalfa was first brought to Hawaii from California by the Hon. D. P. R. Isenberg and planted with success at Waialae, Oahu.

At present, the plant has spread not only to all parts of America and the Mediterranean region, but to almost every country settled by the white race and where the conditions for its growth are favorable, and, within a comparatively few years, will probably become second only (if not first) to corn as a cultivated forage crop of the United States.

As already indicated, the common synonym of alfalfa is lucerne, but it should not be forgotten that there are many others,⁵ chief of which are Chilean clover, French lucerne, and Purple Medick.

BOTANICAL RELATIONSHIPS.

Alfalfa, being characterized by leaves of three leaflets, belongs to the tribe Trifoliceae or clovers of the family Leguminosae or pod bearers.

According to Carl S. Scofield,⁶ "the prevalent botanical name *Medicago sativa* cannot properly be used for this plant," the correct name being *Medica sativa* (L.) Mill. However, since this was the only reference to any generic name other than *Medicago*, we shall merely pass over the matter at least for the present and cling to the best known name *Medicago sativa* (L.).

The following are the most important species of the genus *Medicago*:

I. *M. sativa* (L.) or common alfalfa flrs. purple, approaching violet, seedpod with 3 spirals (sometimes 2 or 1), stems erect, inclined to be 4 angled. Found in S. Asia, N. Africa and S. Europe. Northern limit, Kopal, S. W. Siberia. Now found in all parts of the world wherever the conditions are favorable.

II. *M. falcata* (L.) or yellow alfalfa flrs. uniformly yellow pods sickle shaped stems spreading to erect. Closely related to *M. sativa*. Considered resistant to alkali, endures severe droughts and cold—good pasture. Found growing 68' N, record min. temp. 67.8° C. Distribution wide over Europe and Asia. Western. $\frac{2}{3}$ of Siberia. Seed brought to U. S. in 1906.

III. *M. media* or sand lucerne. Regarded as a natural hybrid of *falcata* and *sativa* flrs. very pale yellow to green to violet. Example—"grim alfalfa." Sweden, Siberia, Russia, Hungary. Native in Volga region of E. Russia.

IV. *M. glutinosa* (Bieb) or Caucasian alfalfa. Closely related to *M. falcata* 1 of 21 species native to Caucasasia. Native

⁵ "Book of Alfalfa"—Coburn.

⁶ U. S. D. Agric., B. P. I., Bul. 131.

of Caucasian Mts. and Transcaucasia generally, especially Armenia.

V. *M. platycarpa*. Flrs. yellow. Pods large and flat. Stems hard and smooth, almost trailing. Central & S. C. Siberia.

VI. *M. ruthenica*. Flrs. yellow. Pods flat and oval, tapering toward both ends. Low growing type. Distribution, in general, north of *M. sativa* grows in dry, stony soils, almost pure sand. Lake Baikal, Siberia, to Pacific Ocean.

VII. *M. arborea* (L.). Large bright yellow flrs. Largest representative of genus *M.* Over 10 feet high. Native of Med. region of Europe, Asia and Africa. Mentioned in ancient Greek and Roman writers as "cytisus." Less productive, becomes woody too quickly. Value in hot dry places. Remarkable vigor of growth.

VIII. *M. radiata*. This plant is placed in the genus *Trigonella* by all recent botanists.⁷

GENERAL STRUCTURE OF *M. SATIVA*.

Roots. The alfalfa plant has a very strong, tough and deeply penetrating root system, descending five feet in six months and from ten to twenty feet or more where the conditions are favorable. It has been recorded that alfalfa roots penetrated 129 feet below the surface of a tunnel in Nevada. The tap root is usually less than one-half inch in diameter below the crown, though very old plants have reached the size of a man's ankle. The large secondary roots extend directly downward with a slight lateral tendency and bear numerous rootlets which in turn bear elongate oval root tubercles, sometimes appearing in large clusters.

However, it should be noted that in some of our shallow Hawaiian soils the typical tap roots are absent and in their places we find well developed branching roots which spread laterally rather than downward.

Stems. The young seedling has a single erect slightly hairy stem, but the older plant has a great number of stems arising from the large crown and clipped stems. There are generally 20 to 30 stems six to sixty inches tall (usually 18" to 30"), while solitary plants may have 150 to 200 stems and even more.

A plant seven months old of the common Utah variety grown on the College Farm had 308 stems by actual count, and the writer has seen a photograph⁸ of a six months old plant grown under irrigation at sixty feet below sea level in southern California which was a little less than eleven feet in height.

Alfalfa sometimes has underground stems,⁹ some of which may take root and produce new plants.

Leaves. The dark green leaves are pinnate, with three ovate-

⁷ U. S. D. Agric., B. P. I., Bul. 131.

⁸ "Book of Alfalfa"—F. F. Colburn.

⁹ U. S. D. Agric., B. P. I., Cir. 115.

oblong toothed leaflets, one-sixth to one-fourth of an inch in width. When the plant has reached maturity the leaves turn yellow, wilt, and drop off. This suggests the importance of harvesting the crop when in its prime, since the loss of a part of the leaves may represent the most valuable part of the fodder.

Inflorescence. Six to twelve, purple to violet colored flowers are borne in a short compact raceme, forming a headlike cluster at the tip of the branch, each individual flower being borne on a short, slender pedicel. The flowers are generally insect pollinated, but they may be self-pollinated. The many seeded pods are small, slightly hairy, and spirally coiled in two or three turns.

Seed. The light olive green to reddish brown colored seeds are nearly oval to distinctly kidney shaped and bear distinct but not prominent radicles which are about one-half the length of the seed.

There are from 200,000 to 240,000 or more seeds per pound and sixty pounds per bushel.

The seeds germinate in from 3 to 5 days (sometimes 10 days), and the standard of germination is 90 per cent. While seed two or three years old is considered as good as fresh, prime seed has lost only 2.5 per cent. in 10 years. According to the U. S. D. Agriculture¹⁰ ordinary alfalfa seed generally tests as follows:

1st year	93%	germination
2nd year	84%	"
3rd year	79%	"

Adulterations. Before planting the seed, even though its germination be very high, one should test it for purity, for alfalfa seed is sometimes adulterated with cheap clover seeds; the seeds of the worst weeds ever known to the alfalfa grower are also introduced in this way. A little precaution at the proper time may save a great deal of trouble and may even be the means of success instead of failure.

The weed seeds most liable to occur with those of alfalfa are the dodder (large and small), yellow trefoil, bur clover, black medic, curled dock, lambs' quarters, spreading amaranth, green foxtail, witch grass, sweet clover, wild mustard, and Russian thistle, the worst and most serious of which is the dodder.

This plant is parasitic and attaches itself to the alfalfa by means of suckers and twines around the plant till it "chokes it." The best way to destroy a stand of dodder is to plow the infested field before the dodder comes in to seed and plant some other crop for two or more years.

Varieties. Like all other crops, there are a large number of varieties and strains of alfalfa now recognized and being cultivated with varied success according to the geographical and climatic conditions.

¹⁰ Farmers' Bulletin 495.

It seems that alfalfa plants fairly well adapted to certain conditions will not do well at all in others. For this reason it is well to discuss separately the principal features of the various standard varieties.

(To be continued.)

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THE HAWAIIAN FORESTER AGRICULTURIST

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No. 3

"Root Borers and Other Grubs in West Indian Soils," by H. A. Ballou, entomologist of the Imperial department of agriculture for the West Indies, has been issued in the pamphlet series of that department. It is concise in its descriptions and illustrated with more than a score of figures.

An exchange tells of ironbark foliage destroyed by insects, the Lerp (*Psyllidæ*), aphid-like insects which attack eucalyptus trees, suck up the sap and construct delicate shell-like coverings called "lerps," under which they grow, moult several times and then appear as minute four-winged insects, which lay the eggs noticed on the leaves, from which fresh broods soon hatch. Generally only temporary damage of the trees, during the season of prevalence, is caused by the insects. Minute chalcid wasps are parasites of the Lerp insects, checking their unlimited increase.

INTENSIVE FARMING.

Half a page of the Washington Herald was lately taken by an article to magnify intensive farming, the author being Truman G. Palmer, student and writer on agricultural subjects. It is in reply to an interview with Thomas Nixon Carver, of the federal Department of Agriculture, which held that "intensive farming is expensive farming." Referring to a statement by Mr. Carver that the 16,000 acres which had been said was formerly required to support an Indian and his family would now provide farms of 160 acres each for 100 white families, Mr. Palmer says that the "unrepealable law of nature" that drove the Indian out "is equally applicable when comparing the one family which 160 acres will support by 'extensive' agriculture and the four families it will support by applying 'intensive' agriculture." He argues at length that intensive farming will cheapen the cost of living to the consumer while yielding the farmer a greater revenue per acre. Further, Mr. Palmer gives definite instructions in a plan of rotation of crops, to show what he means by intensive farming. Instead of sowing four fields of 25 acres each to cereals annually, the intensive farmer sows three to grain, planting some root crop in the

fourth. This one he plows deeply after fertilizing it heavily, and having prepared his seed bed with care plants it to any kind of a hoed root crop. He cultivates and hoes it thoroughly during the early part of the season, thus killing off the weeds and other noxious growths. The following year a cereal follows the root crop, while one of the first three grain fields is devoted to root cultivation, precisely in the manner of the original field of such crop, and so on, the process being repeated from cycle to cycle of four years indefinitely.

In Hawaii, where land for general farming is exceeding scarce, there can be no question that intensive farming is the only kind for the homesteader and truck gardener.

THE SPINELESS CACTUS.

An Australian correspondent of the *Tropical Agriculturist* (Ceylon) says of the spineless cactus:

"This really wonderful plant is not yet much known and it would prove invaluable to stock owners and others, more especially in poor or dry districts, where vegetation of any kind is grown with difficulty. It is easily grown from the heavy leaves or slabs in any class of dry soil, and after the first year will yield according to conditions from 100 to 200 tons of succulent and nutritious fodder which can be fed to all kinds of stock and more especially dairy cattle. By analysis one ton thereof is equal in feeding value to three-fourths that of lucerne [alfalfa], which is the richest fodder plant grown. During the hot summer months this plant would be luxuriant, and being of a rich juicy nature would also greatly allay thirst and would therefore prove the salvation of stock owners. Some of the species yield 8 tons of well-flavored fruit per acre, which makes excellent jams and jellies, etc., and growers have made up to £160 [about \$800] per acre. The young fleshy leaves are a good and wholesome vegetable when fried like egg-plant or boiled as greens, etc., and they also make good pickles. This very useful plant should prove a very great boon to residents in the East Indies, as not only is it the heaviest yielding fruit and fodder plant yet known, but it will thrive where hardly any vegetation will exist and requires but little attention. Stock owners particularly would find it useful."

A bulletin of the agricultural department of Trinidad and Tobago gives an estimate of the profit in making paper from the megass furnished in cane sugar factories. It takes into account the cost of a paper mill—roughly \$100,000 for one of 40 or 50 tons of paper capacity per week—with interest thereon, repairs, depreciation and difference of value between coal and megass as

fuel for the sugar factory, and finds a profit of about \$6.50 per ton of megass converted into paper. It is premised that there should be a local demand for the unbleached wrapping and packing papers contemplated to be produced. Hawaii imports about a quarter of a million dollars' worth of paper not specified in the more expensive classes each year from the mainland, and probably a large portion of this "all other" item consists of the unbleached qualities in question. With a development of miscellaneous fruits trade, no doubt the demand for packing papers would greatly increase.

Last year Hawaii shipped to the U. S. mainland canned pineapples to the value of \$4,054,711 and pineapple juice to the value of \$106,510. In the same period its exports to foreign countries of all kinds amounted to \$989,730, as compared with \$532,666 in 1912, or an increase of nearly 86 per cent., much of which is due no doubt to the pineapple industry. To the United States the shipments of canned pines have nearly doubled in the past two years.

Rubber Day at the rubber and tropical products exhibitions in London has been fixed for June 24. Prince Arthur of Connaught will open the exhibitions, of which King George is the patron, and the Right Hon. Lewis Harcourt, M. P., secretary of state for the colonies, will deliver an address on the occasion. Nothing appears to be doing toward having Hawaii represented with its rubber and other tropical products in these exhibitions.

Entomologist Ehrhorn, in his report for February, relates a highly humorous incident occurring in the inspection of packages from Japan.

Official reports from the State of New York indicate that the regulation of dairies there, with regard both to tuberculosis control and general sanitation, is far behind the conditions achieved on this island of Oahu through the coöperation of the territorial and the municipal authorities. If Dr. Norgaard has his way, the conditions on all the islands will ere long equal those on Oahu.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, March 16, 1914.

The Honorable the Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I regret to state that my health has continued highly unsatisfactory during the greater part of the past month, the swollen condition of my feet (dermal neuritis) compelling me to keep to my room unless important business during the absence of my assistant in the country made it imperative that I attend to it in person.

In spite of this I have given full time to the work of the division, a number of important reports having been received from various federal and state authorities, principal among which are the "Proceedings of the American Veterinary Medical Association" at its 50th anniversary meeting in New York last fall, and which contains a number of valuable papers on the eradication of bovine tuberculosis and its relation to tuberculosis among children.

It is also gratifying to learn that the intradermal tuberculin test, which we have now used here between three and four years, is finally gaining recognition and that several states have now adopted it for official tuberculosis work. California especially has given much thought and work to the problem and mentions the favorable results obtained in this Territory.

In regard to the susceptibility of children to bovine tuberculosis, it would now seem to be definitely settled that the danger to children from tuberculous milk is very great. Following the Tuberculosis Congress in Washington in 1908, where Prof. Koch again asserted his opposing views, Dr. Park, the director of the laboratories of the board of health, started to work on this subject, and has now demonstrated that in the city of New York upward of three hundred children die every single year from bovine infection—three hundred fatal cases occur each year in the single city of New York. Dr. Park estimates that this number amounts to about $12\frac{1}{2}$ per cent of all the fatal cases of tuberculosis in children, and adds, "Surely we need no better evidence than that to demand of us the protection of human beings against bovine tuberculosis."

Dr. Park has also collected figures from all parts of the world, and these are very interesting. He says: "In adults 787 cases have been examined, of which 777 show human infection and 10 show bovine infection. The conclusion is that, so far as we can judge, adults are probably fairly immune to bovine tuberculosis infection. Coming to children from five years of age to sixteen years of age, we have 153 cases, 117 of which were of human and 36 of bovine origin. Coming to children five years old and

under, we have 280 cases, 215 of which were human and 65 bovine, coming very close to the figures taken from clinical work in England, from which we get the best information on this subject, namely, that from about 23 to 25 per cent of the fatal cases of tuberculosis in children are due to bovine infection. And these figures do not include the numerous non-fatal cases which produce only more or less permanent and more or less severe deformities of the skeleton—hipjoint disease, psoas abscesses, enlarged glands of the neck, etc. When we come to take these into account it seems fairly evident that 30 per cent of the cases of tuberculous children are due to bovine infection." Another eminent authority, Dr. Stiles of Edinburgh, has come to the conclusion from clinical evidence that most of these cases of bone and joint tuberculosis were of bovine origin. Being called into consultation once he made a diagnosis of bovine tuberculosis in a child who was too far gone to be helped and died within a few days. The father said the infection could not be bovine as he kept his own cow, and she had been tuberculin tested. The cow was killed and found to be simply riddled with tuberculosis—a far advanced case, such as frequently fail to react to the test. The father was so impressed that he then and there gave a large sum of money for an investigation, the results of which have just been published, and some of which are interesting enough to be quoted here: "Seventy cases were examined, these being children most of which have not died. Forty-one of these showed the bovine bacillus, and 23 human; three showed both bovine and human bacilli. Sixty-seven of these cases were children twelve years or under, and three adults between 24 and 30 years. Forty-seven were children five years old or under and of these 32 were infected with the bovine bacillus and 15 with the human, a percentage of 68." Dr. Stiles goes on to say: "When we come to examine the family history of these cows, we find some very impressive facts. In 21 cases there was a family history of tuberculosis. Of these, 15 gave human cultures and 6 bovine. That is 71 per cent showed human infection, whereas, in the 52 cases where there was no family history of tuberculosis, 9 prove to be human and 43 bovine; in other words 83 per cent of these cases were due to bovine infection. The final conclusions to this very valuable contribution to our knowledge of the importance of the bovine tuberculous infection to children, are to the effect that "nobody can deny the great danger to human health from bovine tuberculosis." "It is a black spot on the reputation of our civilization at the present time, to permit this preventable disease to continue to reap a harvest of over one million deaths every single year. In the United States alone over 200,000 of our fellow citizens every year go down to their graves from a preventable disease."

I have taken the liberty to quote these figures at length for the reason that the local sanitary authorities, as well as the Anti-

Tuberculosis League of Hawaii, do not seem to realize the immense importance of this source of infection to human beings and especially to children. That there has been a decided decrease in the mortality from tuberculosis among children under five years of age in the district of Honolulu during the past year coincident with the elimination of the tuberculous cow from this same district, while at the same time infantile tuberculosis has been increasing in all other parts of the Territory, is admitted by the Anti-Tuberculosis League. It would therefore seem that no time should be lost in extending the bovine tuberculosis eradication to the other islands, especially as will be seen from the appended letter from the superintendent of the Anti-Tuberculosis League to the effect "that our records show infantile mortality from tuberculous meningitis and other forms of this disease to be far greater on Kauai than on any other island." This information has been communicated to the deputy Territorial Veterinarian on Kauai with a request for information in regard to the prevalence of bovine tuberculosis on that island and what steps are being taken for its suppression. As I expect to visit the island of Maui this coming week I shall look into conditions there with a view to inaugurating an active campaign against the tuberculous cow.

Dr. Fitzgerald reports that glanders has again made its appearance among a certain bunch of horses, through which one plantation mule became infected. By the speedy application of the intradermal mallein test to all exposed animals the infected ones were located and destroyed and it is believed that the outbreak has been suppressed. This matter will, however, have my personal attention, especially as this is the first opportunity to try the new ophthalmic mallein test which has been adopted by the federal Bureau of Animal Industry for use in inter-state shipments of horse stock.

The correspondence pertaining to both the outbreak on Maui and to the new test is herewith appended.

A number of inquiries have been received in regard to the continuation of the quarantine of hogs on the island of Oahu, to which I have replied that the embargo cannot safely be removed for some time yet.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, Feb. 31, 1914.

Dr. Victor A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to report as follows for the month of February:

Tuberculosis Control.

The following herds have been subjected to the intra-dermal tuberculin test:

	T.	P.	C.
Charles Lucas	82	80	2
T. F. Farm.....	40	35	5
F. Medeiros	21	21	0
P. Miyakawo	15	15	0
K. Inouye	17	17	0

The total number injected is 175, out of which 168 have been passed and 7 condemned and branded. It was surprising and also discouraging that five cows were condemned at Farm's dairy, but considering the fact that Mr. Farm has never followed our instructions in regard to disinfecting after each test the result could not have been otherwise. He now intends to remove all the old feed boxes, replacing them with new ones and give his barn a complete and thorough disinfection.

Importation of Live Stock.

Feb. 2—S. S. Sierra, San Francisco. 4 crates poultry.

Feb. 2—S. S. Matsonia, San Francisco: 16 crates poultry; 1 dog, Mrs. J. M. Senni.

Feb. 4—S. S. Missourian, Seattle: 17 horses; 200 hogs (slaughter), 77 hogs (breeding), 5 crates poultry, A. L. McPherson.

Feb. 6—S. S. Tenyo Maru, Orient: 6 crates pheasants, E. H. Paris.

Feb. 9—S. S. China, San Francisco: 1 dog, Wells Fargo Ex. Co.

Feb. 10—S. S. Ventura, San Francisco: 7 crates poultry; 1 dog, Nellie Adams.

Feb. 16—S. S. Mongolia, Orient: 1 dog, J. C. Collins.

Feb. 17—S. S. Wilhelmina, San Francisco: 29 crates poultry.

Feb. 20—S. S. Sonoma, Sydney: 1 cat, Mrs. C. D. Thomas.

Feb. 24—S. S. Honolulu, San Francisco: 2 Shorthorn bulls, Antonio Perry; 7 crates poultry.

Feb. 26—S. S. Niagara, Vancouver: 1 dog, Mr. Payne.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, Feb. 28, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the Division of Entomology work for the month of February, 1914, as follows:

During the month 34 vessels arrived at the port of Honolulu, of which 24 carried vegetable matter.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	683	15,276
Fumigated	1	27
Burned	41	43
Returned	4	42
Total inspected	729	15,388

Of these shipments 15,186 packages arrived by freight, 124 packages by mail and 78 packages as baggage of passengers and immigrants.

Rice Shipments.

During the month 18,005 bags of rice and 1721 bags of beans arrived from Japan and being found free from pests were passed for delivery.

Pests Intercepted.

Thirty-three packages of fruit and 4 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited from entry, was seized and destroyed by burning.

One lot of orchids from Costa Rica, Central America, came by local boats and in the packing were found a few Tenebrionid beetles and some ants. These plants were fumigated and the packing destroyed. A permit from the federal horticultural board accompanied the shipment.

Two cases of apples were returned to the storeroom of the transport Sherman, having been found infested with Codlingmoth.

Thirty-eight sacks of potatoes arrived from Sydney, Australia, and under a ruling of the federal horticultural board of the United States Department of Agriculture could not enter the Territory on account of not having the required permit and the shipment remained on board of the S. S. Marama.

Probably the most remarkable seizure ever made by the division took place in the postoffice. A package of twigs from Japan was held for our inspection and on opening the same the inspector

found tree twigs which were hollow, each opening plugged up with twisted grass. A closer examination disclosed the fact that each twig contained a good, fat, live borer. A letter was enclosed in the packages and the same, after having been translated, told the following story:

"Greetings: This time I am sending you some medicine, good for consumption. Open the twigs and you will find a worm (*Sabutori-mushi*) in each twig. Take out one and wrap it in sembi or ame and swallow it alive. The juice of the living worm is good for the disease. However, if the worms are dead, you can bake them until black and powder them up and drink it with sake. Those I send will constitute a dose for one week. When you take the worms please inform me if you digest the same. If you should find any such worms in Hawaii, continue taking same for some time," etc., etc.

The worms found in the twigs represent two distinct orders of insect. Some were the grubs of a large stem-boring beetle belonging to the *Cerambycidae*; the others the larvae of some stem-boring moth. The package was seized and the contents are now the property of the board museum, as alcoholic specimens. This illustrates another channel through which some serious pest might enter the Territory. Worm diet for the cure of the white plague might be all right in Japan but we have not as yet heard of this method being used here and we surely shall not allow a trial with imported borers such as were found in the mail package.

Hilo Inspection.

Brother Matthias Newell at Hilo reports the arrival of 7 steamers, all of which brought vegetable matter consisting of 91 lots and 1962 packages. Three sacks of turnips had to be cleaned of earth and 39 bags of potatoes were too scabby to land and as no one wanted to pay for the return freight, they were dumped at sea.

Inter-Island Inspection.

During the month of February 52 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	78 packages
Taro	960 bags
Fruit	18 packages
Vegetables	42 "

Total passed 1098 packages

The following packages were refused shipment on account of

being either infested with pests or having soil attached to the roots:

Plants	16 packages
Fruit	8 "
Vegetables	2 "
Total refused	26 "

Respectfully submitted,

E. M. EHRTORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, Feb. 28, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows, the routine report of the Division of Forestry for February, 1914:

Forest Reserves.

On February 12 a public hearing was held by Governor Pinkham and the Board of Agriculture and Forestry to consider the setting apart as an addition to the Kaipapau forest reserve, of a part of the land of Hauula, and as a new forest reserve, of the upper portion of Kuliouou valley, both on Oahu. Objection being made by certain of the Hauula homesteaders to the location of the proposed makai boundary, Governor Pinkham postponed action by taking the matter under advisement. There being no objection to the reservation of Kuliouou, the Governor, on February 13, signed a proclamation officially setting this land apart. The area is 214 acres. It is the thirty-fifth forest reserve to be made in the Territory of Hawaii and brings the total area in the system up to 787,083 acres, of which 69 per cent., 541,091 acres, is government land.

Forest Fences.

Early in February I made a quick trip to Kauai to inspect the recently completed forest fence on the boundary of the Moloaa reserve and to make further arrangements in connection with the building of another fence on the government land of Wailua, mauka of Lihue. On February 20, Mr. A. M. Brown notified me of the completion of the fence on the Kula forest reserve boundary, Maui, required to be built under leases held by the

Cornwell Ranch. Mr. Brown further said that the tree planting called for under the same leases was going forward satisfactorily, the number of trees in the ground being up to the requirement for this time.

Considerable preliminary work was done during the month on other fence projects which will be reported on to the Board in the near future.

Special Reports.

Toward the end of the month several letters and brief reports were got ready containing recommendations on forest matters that had recently been referred to me for investigation. Also during February I prepared for the use of the Board a short report covering the routine work of the Division of Forestry for the calendar year, 1913.

Tree Planting and Seedling Distribution.

Good progress is being made in the tree planting on the slopes of Sugar Loaf, above Makiki valley, Honolulu, and recently the Division of Forestry has succeeded in making better provision for supplying seedling trees to homesteaders in several newly opened tracts in different parts of the Territory. Mr. Haugh's report, transmitted herewith as usual, gives additional facts and figures.

Forest Fire Service.

Owing to removal from Maui, Mr. A. K. Jones resigned early in February as district fire warden for Kahikinui and Honuaula, Maui. His resignation was accepted at a meeting of the Board held on February 26, 1914. No one has as yet been appointed in his stead.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, February 28, 1914.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—Herewith I submit a report of the principal work done during the month of February, 1914:

*Nursery.**Distribution of Plants.*

	In Boxes Transplanted.	Pot Grown	Total.
Sold . . . . .	...	38	38
Gratis	250	2314	2564
	250	2352	2602

Collections.

On account of plants sold.....	\$1.20
On account of seed sold.....	8.00
Total	\$9.20

Plantation Companies and Other Corporations.

During the month we distributed 5500 seedlings in seed boxes, 400 in transplant boxes and 500 pot grown. Total, 6400. The species consisted of eucalyptus and casuarina.

Experiment Garden, Makiki.

The principal work done at this station during the month consisted of transplanting seedlings, mixing and sterilizing soil and doing other routine work.

Honolulu Watershed Planting.

Three extra men were engaged and started work on February 16th, making a gang of eight men altogether. Trees to the number of 458 were planted out. Other work done consisted of clearing off and making holes. The total number of trees planted on Sugar Loaf up to the end of February amounted to 2544, all of which are koa.

Very respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, March 10, 1914

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during February, 1914, is submitted:

DROUGHT.

The rainfall during February was generally very light, with the result that all streams are very low. While all reports from other islands have not been received, indications point to the driest February in a long period of years. All streams on Oahu are at the lowest discharge recorded in the past three years.

Should the 1914 summer season follow its usual regime, indications point to a great shortage of water, and water users should plan for such a condition.

SERVICE RECORDS.

Daily service records of each employe are filed in the Honolulu office, and are available for inspection. The records show the location and services performed by the employe.

G. K. Larrison, Superintendent.

Twelve days were spent in the field, including a reconnaissance of Molokai from February 11 to 18. Further reconnaissance was made of the Haiku, Kahana, and Punaluu valleys, on Oahu, with H. Kimble, Assistant Engineer, who will begin the construction of clock register stations on these streams, March 4. The rest of the month was spent on estimates, computations, and general supervision work.

J. C. Dort, Office Engineer, Oahu.

Five and one-half days were spent in the office, 31 stream-gaging stations and one rain gaging station were visited, and two stream measurements made. The greater part of the month was spent on computation and compilation work in connection with the 1913 Progress Report.

C. T. Bailey, Assistant Engineer, Maui.

Twenty-five days were spent in the field, including a reconnaissance of Molokai from February 11 to 18 with the Superintendent. Nine stream-gaging stations were visited on Maui, and

eight measurements were made. Two and one-half days were spent on an investigation of the water supply of Wailuku.

II. Kimble, Assistant Engineer, Kona and Oahu.

February 6 to 13 were spent on the special Kona investigation in measuring the capacity of one of the typical water holes in South Kona. At the time the field work of this investigation was being made, wet weather conditions prohibited the measuring of the capacities of the typical water holes of Kona. This work was consequently postponed until dry weather was reported.

Mr. Kimble spent three days on Maui on construction work on the new clock register station on the Halawaliili Stream. The last five days of the month were spent on stream gaging and construction work on Oahu.

W. F. Hardy, Field Assistant, Kauai.

D. E. Horner, Field Assistant, Kauai.

Mr. Hardy spent the greater part of the month collecting, checking, and copying Kauai rainfall and run-off data for the 1913 Progress Report. The Stevens clock register station on the Kalihiwai River was completed—all except installing the register on its pedestal. This will require about one-half day's time. Construction on the new trail from Lumahai to the new station site (about five miles long) was started. Mr. Hardy spent ten and one-half days in the field, visited ten stream-gaging stations, and made one stream measurement.

Mr. Horner spent all 28 days in the field, visited seven stream-gaging stations, and six mountain rainfall stations. Fourteen days were spent on the construction of the Kalihiwai Station

H. A. R. Austin, Field Assistant, Oahu.

Eighteen days were spent in the office on computations, checking, etc., and four days in the field. Twenty-one stream-gaging stations and three rainfall stations were visited.

G. R. White, Field Assistant, Oahu and Maui.

Nine days were spent in the field on Oahu, and four days on Maui. Thirty-five stream-gaging stations were visited, and twenty-four stream measurements were made.

1913 PROGRESS REPORT.

All original data for the 1913 progress report are complete, and blue prints are being made preliminary to sending the original

data to the Washington office for publication. The services of Mrs. Dort and Mrs. Kennedy, who were employed in this work during the month, were dispensed with on February 28.

SUMMARY OF STREAM-GAGING STATIONS FOR MONTH.

Island.	At End of Month.	Est'd During Month.	Discont'd During Month.
Kauai	31	0	0
Oahu	40	2	0
Maui	43	0	0
Hawaii ¹	1	0	0
Total	115	2	0

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

KULIOUOU FOREST RESERVE.

On February 12, 1914, a public hearing was held by the Governor of the Territory of Hawaii and the Board of Commissioners of Agriculture and Forestry to consider the setting apart as a forest reserve of a small area of forest land at the east end of Oahu, near Koko Head. The tract is the upper portion of the half of Kuliouou valley owned by the government, 21½ acres.

The purpose of creating this land a forest reserve is to afford better protection to the small stream that flows down the valley and waters the dry lower lands. No opposition developing to the project, Governor Pinkham on February 13 signed a proclamation officially setting the land apart. This is the first forest reserve to be made by him, the thirty-fifth in Hawaii.

Following is the report of the Superintendent of Forestry on Kuliouou. Elsewhere in this issue of the Forester appears the proclamation:

Report of the Superintendent of Forestry.

Honolulu, Nov. 12, 1913.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to recommend the setting apart as a forest reserve of the mauka section of the government land of Kuliouou in the Honolulu district, Island of Oahu.

Kuliouou is a small, detached government land at the east end

· Kona investigation station.

of this island. It comprises the east half of the valley of the same name, the remainder being in fee simple ownership, and now under the control of Judge Frank Andrade. The makai portion of Kuliouou was cut up into beach lots and disposed of something over a year ago. An area of grazing land, 173 acres, above these lots and running up to the line of the proposed forest reserve, was leased on November 8, 1913, to Mr. Andrade. This lease carries a provision that a fence must be built on the forest reserve boundary within one year.

The section now proposed to be set apart is the mauka end of the valley, an area of 214 acres. The line was determined after a personal visit made to the tract, when I was accompanied by Mr. W. E. Wall, the government surveyor.

The object of the proposed reserve is to protect the stream that runs intermittently in the upper portion of the Kuliouou valley. Water is said to be found in pools much of the time, above the reserve line. Below, the stream bed is dry, except during rains. With a dense forest cover restored there is good reason to think that this source of water could be made a much more dependable, though limited supply.

Efficiently to protect the valley of Kuliouou will require the coöperation of the owner of the west, or fee simple half. From conversations had with Mr. Andrade on this matter I believe it will be possible to effect this. A comparatively short stretch of fence across the fee simple land, from the end of the required government fence to a pali, would block cattle from getting mauka.

There are said to be goats on the ridge above Kuliouou, that work over from the adjoining fee simple land of Maunalua, on the east. Just how much damage they are doing I am not in a position to say.

Between Kuliouou and the east end of the Honolulu Watershed forest reserve, at Palolo, is a stretch of privately owned land, in part belonging to the Bishop Estate. On a good part of it provision has been made by the owners for forest protection. While part of this fee simple area is thus being treated as a forest reserve it has for various reasons not been considered advisable to include it in the present project. The Kuliouou forest reserve as proposed includes only the above described piece of unleased government land.

Accompanying this report is the official technical description of boundary, prepared by the Government Survey Office as C. S. F. No. 2363.

For the reasons set forth above I do now recommend that the Board approve the creation of the Kuliouou forest reserve and call upon the Governor of the Territory to cause the land to be so set apart.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

ALFALFA—A PROMISING FORAGE CROP FOR HAWAII.

By WILLIAM H. MEINECKE, Class of 1913.

(Continued.)

1. *Chilian or common or California alfalfa.*

The common alfalfa is distributed practically throughout North and South America and Hawaii, and is especially adapted to those sections of Southern California and the Western States, and also Hawaii, where the climate is mild and where there is a fair amount of rainfall or irrigation water. While it does fairly well in dry regions, it is best suited to those places where the water table is fairly high, and will respond wonderfully to proper irrigation. It can withstand fairly severe winters, but it is not considered the best variety for the northern conditions.

The many strains of this variety are commonly known by the name of the state or region from which the seed is obtained, e. g., Utah, California, Kansas, etc.

2. *Arabian alfalfa* (*M. sativa arabianica*).

As the name indicates, this variety was discovered in Arabia and was imported directly into the United States in 1902, and the first seed planted in Hawaii was obtained directly from Washington, D. C.

This variety is readily recognized by its thick succulent stems and large dark green hairy leaves. It is a very rapid grower and recovers quickly after cutting, the crop maturing within three weeks and in general one to two weeks earlier than the common variety. It cannot withstand frost or drought and is generally more susceptible to plant diseases than the other varieties, but will do very well in humid regions or where irrigation water is abundant.

3. *Turkestan alfalfa.*

Turkestan alfalfa was imported into the United States in 1898 and brought to Hawaii within the last decade. This variety is considered more resistant to cold and drought than the Chilian and has proven in South Dakota¹ to be more drought and cold resistant than Grim's alfalfa, but in North Dakota², with the temperature at 35° F. (1906-7), fifteen percent of the Turkestan plants were winter killed against five percent of those of the Grim

¹ U. S. D. A., B. P. I. Bul. 196.

² U. S. D. A., B. P. I. Bul. 185.

variety. (The intense cold was accompanied by a heavy snow-fall, which undoubtedly saved most of the plants.)

During the tests made by the Hawaii Station in 1910-11, this variety did not yield as much seed or fodder as the Chilean and Arabian, but it may prove valuable in some other parts of the Territory where the conditions are warmer and dryer. It may be also interesting to note that the Turkestan "is decidedly inferior in the humid sections of the Mississippi River, but has given somewhat better results than the ordinary alfalfa in the semiarid portion of the great Plains and in the Columbia Basin."³

4. *Australian alfalfa.*

The so-called Australian variety is probably a strain of the Chilean, which has been grown in Australia. Its foliage is somewhat darker and slightly more dense and fine than the latter, but from all practical standpoints it is the same.

The College of Hawaii has a plot of an eighth of an acre planted to this strain, but it has not proven to be quite as productive as either the Utah or the Kansas strain.

5. *Peruvian alfalfa.*

Peruvian alfalfa is very much like the Arabian in its lack of ability to withstand cold and drought. It is more woody than the latter and has proved to be inferior to other varieties in the North Western States, but is highly recommended by the Department of Agriculture⁴ for the Southwest.

It has been planted at the Hawaii Station, but no reports as to its merits have been published.

6. *Ecuador alfalfa.*⁵

The Ecuador variety originated in the mountains at about 9000 feet elevation. It starts a little slower than other varieties, but soon maintains a fast, steady, vigorous, erect growth. It is quite profusely covered with hairs and is readily distinguished by its very dark green color. The stems are coarser and more rigid than usual. It seems to be more woody than most of the others, with a less amount of foliage, and withstands well the changes in temperature but does not yield as well as the others.

7. *Tripoli or Algerian and Oasis.*

The Tripoli or Algerian and Oasis varieties are not easily winter killed, but grow very slowly and are of a pale, sickly color,

³ Farmers' Bulletin 339.

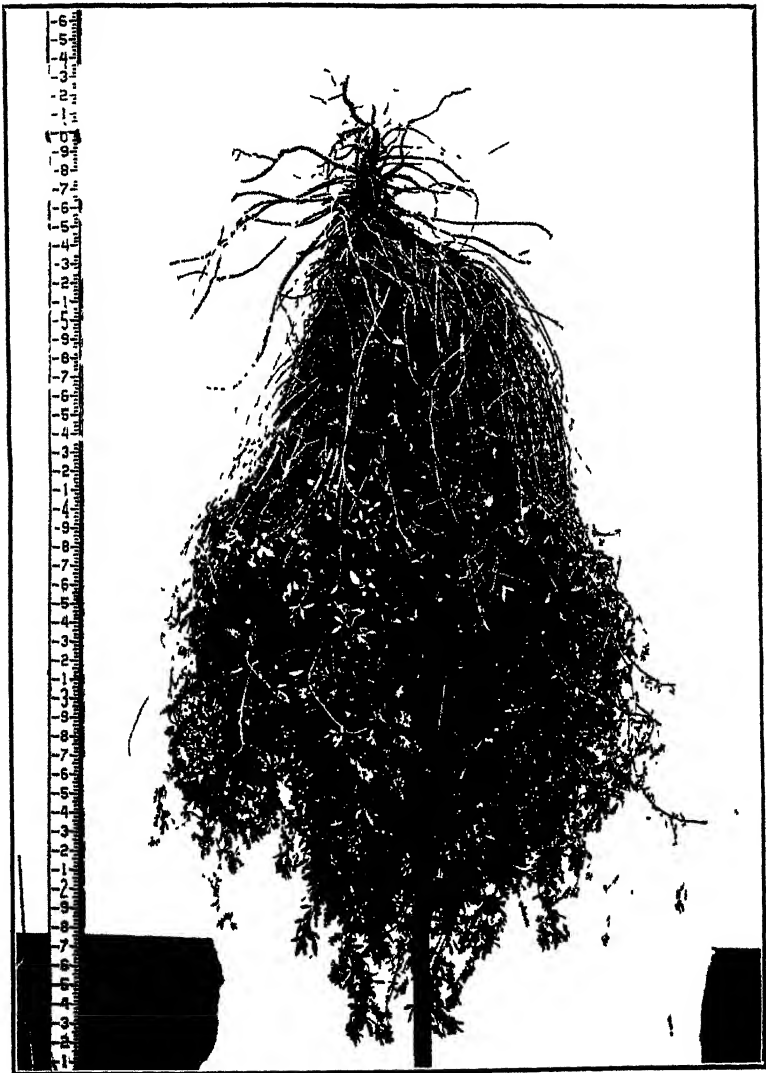
⁴ Nev. Sta. Report 1909

⁵ Nev. Sta. Report 1909

indicating their inadaptability to the climate of the United States, especially that of the West.

8. *French or sand lucerne.*

French or sand lucerne has very pale purple flowers, some of them almost white. It is said to be a different species of alfalfa



Typical breeding plant of Alfalfa one year old (grown on shallow ground).

(*M. media*), but it is also believed to be a natural hybrid of *M. sativa* and *M. falcata*. It yielded well in Utah, Colorado, and Nebraska, but did not do very well in Nevada and Texas. There are numerous strains of this variety, chief of which are the German, Baltic, and the famous Grim's alfalfa.

The latter is one of the most hardy of all alfalfas. It will not only withstand intense cold and drought but will do well on poorer soils than do others, its chief drawback being its tendency to lodge.

9. *German strain.*

A German strain of *M. medica* grown by Mr. Isenberg at Waialae, Oahu, proved to succeed much better than the common alfalfa. It is now exclusively grown there.

10. *Grim's alfalfa.*

Grim's alfalfa was originated by Mr. Grim of North Dakota. It is a close second if not a better variety than the Turkestan in the matter of resistance to cold and drought and has out-yielded it in several trials made in South Dakota. It is generally considered to be better adapted to northern conditions than to the southern.

11. *Baltic alfalfa.*

Baltic alfalfa originated in Baltic, South Dakota, and is believed to be a strain of Grim's.⁶ It resembles the latter very closely, is free from a bacterial disease common to all others, and is not so liable to lodge as the other strains of *M. media*.

So far as the writer can determine, only the following varieties have been grown in Hawaii thus far. They apparently succeed best in the order given:

- | | |
|------------------------|-------------|
| 1 Utah (Chilian) | 5 German |
| 2 California (Chilian) | 6 Arabian |
| 3 Kansas (Chilian) | 7 Turkestan |
| 4 Australian (Chilian) | 8 Peruvian |

Semipalatinsk Alfalfa. Since the above was written a new dry-land alfalfa (Semipalatinsk Alfalfa) has been introduced to the Islands by Messrs. H. Huckfeld & Co., through the efforts of their manager, Mr. J. F. C. Hagens. This seed was collected in Siberia in 1913 by Prof. N. E. Hansen of the South Dakota College of Agriculture. Of it, Prof. Hansen says:

"These seeds were gathered upon my fourth expedition to Siberia on the dry, open steppes near Semipalatinsk, Southern Siberia. This is a region with a total annual precipitation of eight inches, including both rain and snow, and with a temperature range of from 106 degrees in summer to 50 degrees below zero Fahrenheit in winter, often without snow. The expedition was authorized by the South Dakota State Legislature, March, 1913. * * * My opinion is that they will be a great help to agriculture on the highest and driest uplands of a number of our western states where no irrigation is possible."

It is hoped that this variety may prove useful for our dry uplands. We understand that the seed is being rather widely distributed over the group and that extensive plantings are to be made on the Island of Lanai.

F. G. K.

⁶ Col. Sta. Report 1910.

CONDITIONS AFFECTING SUCCESS WITH ALFALFA.

1. *Climate and Soil.* Alfalfa is naturally adapted to a warm climate; in deep soils it is highly drought resistant, but is also well adapted to irrigation. In general it does not endure very severe winters and an excess of rainfall or irrigation is decidedly injurious. Regardless of its nature the soil must be well drained or the crop will fail, as alfalfa is a plant which cannot stand "wet feet."

It succeeds best on a neutral soil, and will adapt itself to an alkaline soil, but is an absolute failure where there is more or less acidity or "sourness." A clean, deep and well drained, light, loamy soil is best, but heavy clay soils may be so modified as to yield profitable crops, provided they are not permitted to become water-logged and sour. Calcareous soils in humid regions are very good, and even the chocolate colored river bottoms and maize and oat lands are well adapted to alfalfa.

Another essential for success with alfalfa is the presence of specific nitrifying bacteria in the soil and a fair amount of humus, since humus is necessary for the best growth of bacteria and the plants can not do well without their presence. The lack of these bacteria in the soils of the Eastern States in the early days has proved to be the principal source of failure of alfalfa or rather lucerne as it was then called.

2. *Treatment of the Soil.* Alfalfa is not stoloniferous and poliferation is so very rare that it practically cannot spread, and especially when young is unable to choke out other plants as do the grasses. It is therefore very essential not only to plow deeply in order to allow the long roots to penetrate deeply, but also to cultivate in such a way that the land will be practically free from weed seeds and in very good tilth before the seeds are sown.

If the land is lacking in lime, it should be *applied before plowing* at the rate of from one-half to one ton of burned lime, or twice as much ground limestone per acre. During the plowing the lime will then become thoroughly mixed with the soil and will therefore be more efficient. It is well also to add manure before planting and mix it thoroughly with the soil.

If the land is virgin to alfalfa or has not become thoroughly inoculated it is well also to add at this time about one-half ton of soil from a field known to produce good alfalfa plants whose roots are abundantly supplied with nodules. If such soil is not conveniently available, "canned bacteria" or "nitragin" (pure nitrifying bacteria) may be used instead.

A one-pound can of "nitragin" as put on the market commercially is sufficient to inoculate one acre. In purchasing nitragin, care should be taken to ask for "nitragin for alfalfa," as the varieties of this material are specific, and a variety for cow peas will not do for alfalfa.

Most of our soils in Hawaii are fortunately already inoculated

with bacteria and the need of inoculation is not very great. If a field of alfalfa does not do well after a few weeks or better a few months' growth, carefully dig up a few plants and wash away the soil. The absence of nodules on the rootlet is a sure indication to the need of inoculation. (Since the nodules are easily knocked off the roots, extreme care should be used in removing the plant and in washing the soil from it.)

3. *Kind and Quantity of Seed and Method of Planting.* With all other conditions supplied, there still remains the matter of good pure seed. This should be plump, of strong germination, and free from weed seeds. Much of the commercial seed sold in bulk contains dodder and other weed seeds which are difficult to separate from the alfalfa seed. If possible, seed should be secured from a source known to be free from dodder or carefully re-cleaned seed should be used. While it is somewhat difficult to separate the large seeded dodder from ordinary alfalfa seed it can be done by using a screen made of 20 x 20 mesh, No. 34 steel or iron wire on the W. & M. gauge; or, the same mesh of brass or copper wire, No. 32, English gauge. This should be stretched over a light wood frame about 12 inches square. A half pint of seed should be placed in the sieve at a time and thoroughly sifted until all dodder seed is removed. This will require a half minute vigorous shaking, and the results will well repay the trouble.⁷ This one feature should not be slighted, for "Trouble with weeds has caused more alfalfa failures than any other one thing."⁸ It is said that "an ounce of prevention is worth a pound of cure," but in the case of alfalfa it is not only worth a ton of cure, but is the deciding point between success and failure.

(To be continued.)

⁷ Hawaii Sta. Bul. 23.

⁸ Indiana Sta. Cir. 27

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF
HONOLULU, CITY AND COUNTY OF HONOLULU, ISLAND OF
OAHU, TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said Acts provided, do hereby SET APART as a forest reserve to be called the KULIOUOU FOREST RESERVE, that certain piece of government land in the District of Honolulu, City and County of Honolulu, Island of Oahu, Territory of Hawaii, which may be described roughly as being the mauka portion of the government half of Kulioouou Valley, and containing an area of 214 acres, more or less, more particularly described by and on a map made by the Government Survey Department of the Territory of Hawaii, which said map is now on file in the said Survey Department, marked "Government Survey Registered Map No. 2520," and "Kulioouou Forest Reserve," and a description accompanying the same numbered C. S. F. No. 2363, which said description, now on file in the said Survey Department, is as follows:

KULIOUOU FOREST RESERVE.

Kulioouou 1st, Kona, Oahu.

C. S. F. No. 2363.

Beginning at a pipe at the southwest corner of this reserve on the boundary between Kulioouou 1st and 2nd, the coordinates of said point referred to Government Survey Trig. Station "Koko Head" being 14704.1 feet North and 7428.8 feet West, as shown on Government Survey Registered Map No. 2520, and running by true azimuths:

1. 176° 37' 6964.0 feet along the land of Kulioouou 2nd to the top of the ridge overlooking Koolau at a place called Ele lupe;
2. 313° 05' 1718.0 feet along top of mountain range along the land of Waimanalo;
3. Thence down the top of the ridge along the land of Maunaloa to an iron pipe, the direct azimuth and distance being 349° 10' 5439.0 feet;
4. 76° 50' 1917.0 feet along pasture land of Kulioouou 1st to the point of beginning.

Area, 214 acres.

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

DONE at the Capitol in Honolulu, this 13th day of February, A. D. 1914.

LUCIUS E. PINKHAM,
Governor of Hawaii.

By the Governor:

E. A. MOTT-SMITH,
Secretary of Hawaii.

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THE HAWAIIAN FORESTER AGRICULTURIST

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No. 4

A FENCE POST TEST PROGRESS REPORT.

A year ago a letter regarding a fence post test was published in the Forester, that elicited a good deal of interest. The following progress report adds to the information then given. It speaks for itself:

Another year has elapsed since the eucalyptus cornuta fence posts were set at the College of Hawaii farm with a view to testing their durability under various preservative treatments, also in comparison with redwood posts. The test has now completed its third year, the posts having been set about April 1, 1911.

Reporting the condition of the posts in the order recorded a year ago, [see Hawaiian Forester and Agriculturist for May, 1913, Vol. X, No. 5, pp. 113-114,] our findings are as follows:

Charred posts—Average decay 1-12 inches below surface of ground, $\frac{1}{4}$ - $\frac{1}{2}$ inch.

Tarred posts—Average decay 1-12 inches below surface of ground, $\frac{1}{8}$ - $1\frac{1}{4}$ inch.

Creosoted posts—Average decay 6-12 inches below surface of ground, trace.

Posts set in concrete (no treatment)—Average decay 6-12 inches below surface of ground, badly decayed, possibly half way through.

Untreated posts—Average decay 6-12 inches below surface of ground, $\frac{1}{4}$ -1 inch.

It will be noted from the above that the order in which the various treatments resisted decay was as previously recorded, i. e., the creosoted posts being best preserved, showing only a trace of decay; the tarred posts (dipped in hot tar) being the second best preserved. The charred posts appear to have undergone but slight if any decay since the last experiment. On the other hand the posts set in concrete show rapid disintegration, and as noted in my last report, this appears a very undesirable treatment. The untreated eucalyptus posts show some variation in their power to resist decay; the largest amount of decay noted was about 1 inch in depth and the least about $\frac{1}{4}$ inch.

The posts from which the bark had not been removed at the time of setting have now shed practically all the bark and aside from the marred surface which resulted from the work of the

borers during the first year, no injury seems to have resulted. Good sound untreated redwood posts set with the eucalyptus posts show very slight decay at this time.

The writer recognizes that the results reported in these tests are obtained under rather insufficient data to be exhaustive. In the first place there are too few specimens available for examination and secondly the method of examination is hardly adequate. As in these examinations the posts were bared of the first foot of all soil and the condition as there noted recorded, contemplated changes in fencing during the coming year will require that the posts will be removed bodily, thus permitting of a thorough examination.

On the whole, I think the experiment as it stands demonstrates the value of creosoting over all other methods tried. Not alone is this material a very effective preservative, but it is easily applied, and the cost is not prohibitive. I should certainly recommend creosoting at the cost of 12½ cents per post. It is somewhat doubtful whether the cost of peeling at 5 cents per post is justifiable except it be for appearance. Especially since little damage was done the posts other than marring the surface.

I trust that the Division of Forestry may see fit to cooperate with the college in planning a more exhaustive experiment along this line as was suggested some time ago. This would seem an especially opportune time as the college farm contemplates an extensive system of fencing in the near future.

F. G. KRAUSS,
Professor of Agronomy.

The College of Hawaii, Honolulu, Hawaii, March 30, 1914.

HINTS TO ONION GROWERS.

Some hints on the growing and shipping of onions are given by the *Agricultural News*, being mainly from a circular prepared by the curator of the botanic station, Antigua, Leeward Islands. The article says in part:

"As regards seeds, these should not be kept in paper parcels, though they may be stored in air-tight receptacles for a period of a few months. In connection with the nursery work, beds should be prepared before the arrival of seed in order that the soil may 'cool out'; to keep ants away from seed, kerosene should be applied to the bed before germination, not after. As regards watering, a good soaking every three or four days gives better results than daily sprinkling, and the water should not be applied after 8 a. m. In transplanting, the laborers must be carefully watched to prevent their damaging the young plants by careless handling.

"Onions are liable to the attacks of caterpillars. To check this,

dusting with Paris green and lime should be resorted to, but the grower must not dust with any insecticide when the bulbs are nearing maturity.

"Coming to the establishment of the crop in the field, the planter should remember that sowing seed *in situ* will give a crop from three to five weeks earlier in maturing than when the transplanting method is adopted; but it appears that a large proportion of the onions raised in this way may be of indifferent shape. In collecting the crop, the bulbs must not be left in the field for any length of time after pulling, though a few hours in the sun is a good thing. The bulbs must not receive the slightest injury, nor must the necks of the bulbs be twisted to hasten ripening if it is the intention to ship. Onions deep in the soil often rot before they are thoroughly ripe: these should be used to meet local demands; they are unfit for export."

Some American and Canadian markets, it is said, disapprove of onions with thick necks. In the case of produce going to the north, it is advised that the caution, "Keep from frost and boiler," should be put on the crate. The *Queensland Agricultural Journal* is quoted as pointing out "that onions when pulled should not be stored away at once but should be left on the ground for a few hours to dry. They require constant looking over to sort out any bad ones for, as in the case of fruit, a single rotting onion will infect all those in its immediate neighborhood. Reference is made, in continuation, to a very interesting manurial experiment in connection with the effect of chemical fertilizers upon the tendency to sprout. It was found that the produce from plots deprived of sulphate of potash were exhausted by a too hurried vegetation, while that which had received the potash manure was perfectly preserved. The writer advocates the application of 1 cwt. of sulphate of potash per acre."

Six or seven years ago, an exchange says, the output of coconut butter in Austria was about 40 tons a day. It is now approximately 300 tons. The price has increased from \$18.25 to \$26.40 for 200 pounds, and the factories claim they cannot keep up with the demand. The market is controlled practically by two firms, one in Vienna and the other in Aussig.

According to the *Gardeners' Chronicle*, there are indications that the realization of the long-thought possibility of employing electricity in horticulture and agriculture will soon be achieved. Lemstrom, it was pointed out by Thorne Baker in a paper read before the Royal Society of Arts, long ago claimed to have demonstrated that an increase of 45 per cent. in a crop is produced by the agency of high-tension electricity applied to the land through overhead wires. Sir Oliver Lodge, Mr. Newman and

Prof. Priestly, working with overhead discharges, have also obtained encouraging results. It is stated that the cost of the Lodge-Newman apparatus—which, by the way, has been adopted by the departments of agriculture of the United States and Egypt—works out at \$1000 for 25 to 30 acres, and for the treatment of double that area only a small increase in cost is entailed.

Rascality in handling old rice is exposed by the *Queensland Agricultural Journal*, which mentions the fact that powdered talc is used in the renovation of damaged rice. Old, discolored, worm-eaten rice is said to be so treated that it takes on the appearance of new grain, which is said to be very injurious to native laborers in tropical countries where rice is the staple food.

Hawaii is probably nearly ripe for the introduction of an agricultural bank or banks. Homesteaders and small ranchers ought to be placed in position where they could obtain long term loans at moderate interest rates on the security of their land. J. K. Cahill, who investigated the German system of rural credits for the British board of agriculture, in the prefatory note to his report says that in no modern state does organized effort for safeguarding and promoting the economic interests of agriculture appear to have been so persistent and successful as in Germany, more especially in the direction of providing the farmer with facilities for obtaining credit, for acquiring the instruments of production, and for disposing of his produce on the most favorable terms. In Germany landowners can obtain mortgage loans through a variety of special institutions for mortgage credit. At present the total outstanding loans obtained through such agencies may be estimated at approximately two billion dollars. The goal of a coöperative bank loan in practically every parish of the whole monarchy has now been nearly reached. There are in Germany 17,000 agricultural coöperative banks, with a total membership of over 1,500,000. In 1910 the total turn-over of 14,729 such banks amounted to about \$1,273,000,000. In the sixteen years, 1895 to 1910, only nineteen rural credit societies were involved in bankruptcy.

Mr. Thorne Baker's account of electrified chickens (in a paper presented to the Royal Society of Arts) reads more like a chapter in romance than in technology, says the *Gardeners' Chronicle*. The mortality of birds hatched in electrified incubators is said to be extremely small, and the chickens are ready for market in five weeks instead of three months. They thrive on less food, lose their shyness, sparks fly from their beaks when they peck at a finger held out to them—the owner of the finger feels a distinct shock, but the birds seem unaware that they are other than just ordinary chickens.

"Who says rubber does not pay?" *Tropical Life* asks, answering that "Ceylon certainly cannot when conditions are favorable and the estates well managed." As evidence it cites the Ceylon papers received February 28, which show that the "Rubber Plantations of Kalutara" had declared 110 per cent dividend, besides placing to reserve and carrying forward a total of \$45,000.

The *Experiment Station Record* is quoted by the *Agricultural News* as saying: "In the manuring of rice, Japan is very far in advance of any other rice-growing country; in the manuring of mulberry Japan has no equal; in the manuring of tea she is behind Ceylon and in advance of China, and in the manuring of sugar cane considerably behind Hawaii and in advance of the Philippines."

DIVISION OF ANIMAL INDUSTRY.

Honolulu, April 7, 1914.

The Honorable Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the Division of Animal Industry for the month of March, 1914, as follows:

Glanders.

As mentioned in my last report an outbreak of glanders among a bunch of horses and mules running in a pasture belonging to the Wailuku Sugar Company, but owned by various employees, laborers and residents of the district, caused considerable alarm in the neighborhood and especially on the plantation in question, the pastures infected being the rest pasture where the plantation work animals as a rule were turned in from Saturday noon to Sunday evening.

In this same pasture an aggregate of 35 to 40 privately owned horses and mules were allowed to run, the majority of these animals being worthless superannuated scrubs and cripples, useless for any kind of work, but which the respective owners, with the pronounced local characteristic, cannot make up their minds to have destroyed.

The plantation management unfortunately, in some instances at least, is compelled to pasture some of these animals, but, in view of their run down condition and their liability to harbor or carry any kind of parasites or any infectious or contagious disease, it would seem unwise to place them in the Sunday rest pasture, to infect grasses, posts and watering places throughout the week, and then mingle freely with the plantation work stock during Saturdays and Sundays. In this way an old mare with

a colt at foot was turned into the pasture, and, whether due to the change in feed, the drain on her system in suckling the colt or to the exposure to the then prevailing cold winds and rain, she promptly developed acute glanders and proceeded to scatter it broadcast over the pasture. Her condition was noticed shortly afterwards, but not until one of the plantation mules had developed the disease. The mare was then removed from the pasture and was later found only with difficulty. On post-mortem examination she was found to be a typical "carrier" with old characteristic scars in the nose, and numerous calcareous nodules in the lungs, the lesions indicating that the disease had remained dormant in her system for some considerable time and had only recrudesced with the change to the open pasture. The local deputy, Dr. Fitzgerald, immediately upon locating and destroying this animal, rounded up all horse stock with which she had come in contact since developing the disease, submitting them all to the mallein test and destroying six, which gave typical reaction, all of them being animals of little or no value and some of which showed old lesions in the lungs, indicating previous infection. All of these animals belonged to the same owner as the mare in question.

That only one plantation mule should have become infected speaks well for the natural resistance possessed by animals kept in the prime of condition, which was the case with all of the plantation work animals, and there can be little doubt that had they been covered with open harness galls and raw chain sores, such as was frequently the case a few years ago on this as on many other plantations, the infection would have gained entrance into many another animal system. Not until three weeks after it was believed that the outbreak had been completely suppressed did one more mule show suspicious symptoms, when at the request of Dr. Fitzgerald and with the Board's permission I went to Kahului to look over the situation. This case proved, however, to be one of epizootic lymphangitis, a disease in every respect as dangerous as glanders, except that it cannot be transmitted to man, but otherwise absolutely independent of this disease and non-reacting to the mallein test. It is the same disease which some years ago caused such heavy losses to the H. C. & S. Co. and to the Maui Road Board, but which since has been encountered only in scattered and very rare cases in the Islands. It was nevertheless decided to submit the entire Waihee plantation stable to the mallein test, and also to retest the outside animals still running in the rest pasture.

As not a single reaction was obtained, even though the extremely sensitive intra-dermal method was used, it is safe to conclude that the glanders outbreak was suppressed with the destruction of the reactors to the first test, and that the appearance of the later case of epizootic lymphangitis was merely a coincidence. It was nevertheless recommended that the Waihee stables be

thoroughly disinfected and whitewashed, and that the top layer of the stalls be removed and replaced with fresh sand. A most thorough disinfection is always required when dealing with this disease as the specific infection, a fungus of the *saccharomyces* group, is very tenacious to life and much more persistent than the glanders bacillus. In both instances, however, there seems to be local conditions tending to vitiate their original virulence as the simultaneous decrease in the number of outbreaks of both diseases fully demonstrates.

Tuberculin Control Work on Maui.

I am pleased to report that the suppression of bovine tuberculosis on the island of Maui has progressed to a further extent than I felt justified in concluding from the reports received. To this may be added that the H. C. & S. Company has established the best equipped, sanitary and hygienic dairy that I have seen anywhere in the Islands, milking about sixty head of tuberculin tested cows and delivering the cooked and aerated milk in sealed sterilized bottles. Dr. Fitzgerald has tested some 2500 head of cattle and feels certain that little if any milk is being sold or provided from untested cows unless it be in some distant localities or in private families. All reacting animals have been branded and immediately segregated until butchered under his inspection. From his observations it is evident that bovine tuberculosis is much less prevalent than was the case on Oahu four years ago, and which seems to be the case on Kauai. These observations are borne out by a statement from the Board of Health physician on Maui, Dr. McCorsky, who upon inquiry informed me that infantile tuberculosis in any form is very rare and seems to have become more so of late. There is therefore every reason for encouraging this work so well begun, especially considering that no charge has been made for any tuberculin testing or other work connected therewith (meat inspection, for instance) even though his transportation over hundreds of miles in carrying it out has been provided by himself.

In regard to the bovine tuberculosis situation on Kauai, conditions do not seem quite so favorable. A letter received from Dr. Glaisyer and pertaining to this subject is herewith appended and is self-explanatory. The same may be said of the Island of Hawaii from where the correspondence of Dr. Elliot is appended. I shall, however, continue to keep the matter before the respective deputies and will only recommend at the present time that they be provided with the requisite ear tags and pincers as well as with tuberculin and syringes and needles with which to carry out the work without actual expense to themselves.

Honolulu Quarantine Station.

During the past month an addition consisting of two rooms has been added to the keeper's quarters, thereby enabling him to

keep his family living with him. The total cost to the Board of the extension has been \$175.00, all labor having been provided by the regular employees. In order to meet the requirements of the Board of Health it will, however, be necessary to ask for an additional \$15.00 or \$20.00 for sewer pipe vent and trap. This expense was unforeseen, the extension of the one-room covering the old cesspool and necessitating its relocation. But as the health inspector had frequently complained about the old arrangement the change would have had to be effected anyhow before long, as with children living in the house it would have been insisted upon.

The appended report of Dr. Case is interesting in so far as it describes a new method of administering the intra-dermal tuberculin test, evolved by himself, and which seems promising in being less dangerous to the operator as well as more convenient and cleanly, the field of operation being changed from the sub-caudal folds to the lower eyelid. With the cows in the stanchions the operator's place is changed from the gutter behind the animals to the feed alley and the constant danger of being kicked is done away. Besides this the method offers many advantages as described in the doctor's report.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

March 31, 1914.

Dr. Victor A. Norgaard,
Chief of Division of Animal Industry,
Honolulu, T. H.

Sir:—I have the honor to report as follows for the month of March:

Tuberculosis Control.

The cattle in the following dairies have been tested during the past month:

	T.	P.	C.
T. F. Farm.....	29	29	0
I. Nagaki	27	27	0
Chas. Bellina	156	144	12
Alex. Young	39	39	0
S. Tsuda	15	15	0
H. E. Cooper.....	16	16	0
W. P. Alexander.....	6	6	0
F. Andrade	102	96	6
Oahu College	14	14	0
College of Hawaii.....	16	16	0
Mills Institute	15	14	1

	T.	P.	C.
John Gomes	46	46	0
Joe Gouviera	33	33	0
M. F. Brazon	19	19	0
R. Compos	69	68	1
M. Nishimoto	10	10	0
John Alias	6	6	0
R. A. Franco	15	15	0
A. Pacheco	16	16	0
M. M. Pedro	32	32	0
M. K. Young	30	30	0
S. Hiarata	19	19	0
K. Yamashita	22	20	2
S. I. Shaw	31	26	5
J. L. W. McGuire	25	25	0
Victorino Souza	4	4	0
Capt. Hartman	5	5	0
M. Riedel	10	10	0

The above tabulated list shows that 827 head of cattle were submitted to the test of which 27 were condemned and branded. Out of the total number tested 167 received the test for the first time. Practically all of these new cows had been brought over from the Island of Hawaii.

In the last seventy-five or more cows tested I have used the fold of the lower eyelid of the left eye as a more convenient place to make the injection than the sub-caudal fold. The advantages of making the injection at this point are: 1st, the field of operation is clean, there being no possibility of infection from feces or urine and although I have always regarded infection from these two sources as practically nil it is better to do away with any chance of it; 2nd, there is no opportunity for any of the serum to be squeezed out of the tissues as might readily happen in the sub-caudal fold by strong depression and switching of the tail; 3rd, the reactions are as a rule larger, some reaching the size of the closed hand; the view is unobstructed and offers easy comparison with the opposite side; 4th, the head is far more easily fixed and held in the desired position than the hind quarters, thus greatly facilitating the proper injection of the serum and doing away with all injury to the operator from vicious or highly nervous animals.

Importation of Live Stock.

March 2—Sierra, San Francisco: 13 crates poultry.

March 3—Hilonian, Seattle: 2 Berkshire hogs, A. & B. (Kaanapali).

March 3—Matsonia, San Francisco: 6 crates poultry.

March 3—Dix, Seattle: 32 horses, Q. M. Dept.; 1 coach dog, G. Edwards.

March 5—Shinyo Maru, Orient: 1 crate Jap games.

March 10—Lurline, San Francisco: 26 mules, Schuman Carriage Co.; 10 Merino rams, Hind, Rolph & Co.; 7 crates poultry.

March 11—Mongolia, San Francisco: 1 crate ducks, W. F. X Co.

March 13—Virginian, Seattle: 262 butcher hogs, 5 mules, 2 horses, A. L. McPherson.

March 16—Sonoma, San Francisco: 1 English bull dog, J. M. Kelley.

March 17—Wilhelmina, San Francisco: 13 crates poultry; 1 box rabbits, W. H. Hoogs.

March 24—Manoa, San Francisco: 3 parrots, E. O. Childs; 13 crates poultry.

March 27—Chiyo Maru, Orient: 14 crates Chinese pheasants.

March 30—Hyades, Seattle: 1 Berkshire sow, A. & B. (Kaanapali).

March 30—Sierra, San Francisco: 14 crates poultry.

March 31—Matsonia, San Francisco: 17 crates poultry, 3 bxs. rabbits, 3 bxs. white mice, U. S. L. Station; 2 Dachshunds, E. Duisenberg; 1 cage canary, G. A. Marshall.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, March 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of March, 1914, as follows:

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	1227	23,911
Returned to shipper.....	7	166
Fumigated	2	3
Burned	86	91
Total inspected	1322	24,171

Of these shipments 23,785 packages arrived by freight, 262 packages by mail and 124 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month 17,872 bags of rice and 2366 bags of beans arrived from Japan and having been found free from pests the various shipments were passed for delivery.

Pests Intercepted.

Sixty-five packages of fruit and 23 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited from entry, was seized and destroyed by burning.

One hundred and sixty boxes of wormy apples were returned to the shipper at San Francisco and 363 cases containing apples had to be overhauled as a few worms had spun their cocoons on the boxes, but we found the apples free from worms. No doubt these shipments have been standing in a packing house where a lot of wormy fruit has been handled.

A shipment of various species of Yam tubers sent here by the U. S. Experiment Station at Manila for trial in these Islands arrived on the S. S. Siberia. The yams were in good clean condition. However, in the packing we found a nest of our common black ant (*Prenolepis longicornis*). After fumigation we passed the shipment for delivery. Five packages of plants were found in the post office, which had arrived from foreign countries, and as these are prohibited from entry under the new ruling of the Federal Horticultural Law they were returned to the sender.

A small box of dead baked worms, similar to those found in the twigs, and which arrived during last month, was found in the mail. These were to be used as medicine.

Hilo Inspection.

Brother Newell at Hilo reports the arrival of nine steamers and three sailing vessels, of which six steamers brought vegetable matter consisting of 107 lots and 1924 packages, all of which was free from pests. There also arrived direct from Japan per T. K. K. steamer Kiyō Maru 6100 bags of rice and 420 bags of beans, all of which was found free from pests and all passed for delivery.

Inter-Island Inspection.

During the month of February 67 steamers plying between the Islands were attended to and the following shipments were inspected and passed:

Plants	75 packages
Taro	510 bags
Vegetables	32 packages
Fruit	25 "

Total passed 642 "

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to the roots:

Plants	14 packages
Fruit	3 "
Vegetables	1 "

Total refused 18 "

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, March 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have to submit as follows the routine report of the Division of Forestry for March, 1914:

Forest Fencing Projects.

During the month progress has been made on several projects of forest reserve fencing.

Mr. A. M. Brown, for the Cornwell Ranch, Maui, reports the completion of the forest fence on the makai boundary of the Kula Forest Reserve; Mr. Chas. H. Will of Hilo, contractor for the fence at Ninole, Kau, Hawaii, states that that job is finished; and Mr. Alike Dowsett informs me that the repairs on the Lualualei Forest Reserve boundary fence, Waianae, Oahu, are progressing.

After much negotiating a contract has been drawn up and signed for the construction of a forest fence across a portion of the government land of Wailua, Lihue, Kauai, and only the final details wait to be arranged with regard to another forest fence, across the Lualualei Reserve, above Waianae, Oahu.

Work on other fencing projects is going forward on Maui, and

a considerable part of the preliminary detail has been attended to regarding other proposed fencing projects on Hawaii.

Forest Planting.

On March 18th an agreement was signed with Messrs. Macfarlane & Robinson of Paumalu, Oahu, to plant with forest trees a portion of the Pupukea Forest Reserve, formerly known as "Water Reserve A," in return for the temporary use of the land for growing pineapples. The actual tree planting does not take place for some time, but when it is done the trees will get the benefit of the cultivation given the land while under pineapples.

The planting of the slopes of Mt. Sugar Loaf, above Makiki, Oahu, has continued steadily during March. The block of Koa at the head of the sub valley below Round Top has been practically completed. During April a stand of Kukui trees will be put in on the lower slopes, to round out the planted area.

Routine Administration Work.

A considerable part of my time during March was given to attention to the details of various projects now under way in the Division of Forestry and to matters referred to me by the Commissioners. About the middle of the month I devoted parts of several days to assisting the Land Office and the Survey Department in a revision and retabulation of the List of Government Lands. Towards the end of the month I drew up for the use of the Board a revised estimate of expenditures for the remainder of the present fiscal period, to conform to the reduction made necessary by decreased income.

Distribution of Basket Willows.

The U. S. Forest Service having become interested in the experimental planting by this Division of basket willows from the Azores, sent us during March for distribution and trial, cuttings of five species of American basket willows. Part of the consignment has been planted at our experiment garden in Makiki Valley. The remainder of the cuttings have been distributed to correspondents of the Division in different parts of the Territory. This experiment is one that is worth watching for there appears to be no good reason why a considerable industry should not in time be built up here through the manufacture of various articles from basket willows.

As usual I transmit herewith the report of the Forest Nurseryman, recounting in detail the work at the Government Nursery.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, March 31, 1914.

R. S. Hosmer, Esq.,
Superintendent of Forestry.

Dear Sir:—I herewith submit a report on the principal work done during the month of March, 1914:

*Nursery.**Distribution of Plants.*

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold	4000	...	1592	5592
Gratis	250	950	1309	2509
	<hr/> 4250	<hr/> 950	<hr/> 2901	<hr/> 8101

Collections.

Collections on account of plants sold amounted to	\$ 15.55
Rent of building, Nursery Grounds, for 4 months ending with February, 1914	140.00
Total	<hr/> \$155.55

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 1000 in seed boxes, 1250 in transplant boxes, and 455 pot grown, total 2705.

Seed Collecting.

The season is again coming in for the ripening of most of our forest tree seed and our two seed collectors will be busy for some time getting a fresh supply.

Makiki Station.

One hundred of each of the five varieties of the basket willow cuttings received from Washington have been planted and will be given our best attention.

The getting up of a stock, mixing and sterilizing soil and doing other routine work has constituted the principal labor done during the month. A number of the new species received are sprouting and will be ready for transplanting soon.

Honolulu Watershed Planting.

The work of planting Sugar Loaf and the surrounding district is getting along nicely. Trees to the number of 1100 were planted during the month and holes are dug for about 500 more. The total number of trees planted up to the end of March amount to 3740, all of which are Koa.

Advice and Assistance.

For the past six or seven months the writer has not had the time to attend to the giving of advice and assistance with the exception of a few visits per month to places in and around the city, the answering of questions by telephone or people calling at the nursery. I have not been keeping a record of this work for the reason that I considered the giving of advice and assistance in this way was ordinary routine and done as a kind of obligation and only when there was time to attend to such work without interfering with the more important work which we have on hand. Should you and the members of the Board deem it necessary that I shall keep a record of all visits which I make, also the names and addresses of the people who ask questions over the telephone and call at the nursery as well as the questions asked and the answers given to each I will do so and will record the same in my monthly reports.

During the month of March I visited the Capitol grounds at the request of Mrs. F. J. Lowrey; Fort Armstrong, at the request of Captain Hatch; College Hills and Manoa, for the purpose of inspecting the trees along the streets in regard to pruning. There are a few more requests still on the waiting list.

The more important work, and the work with which the writer's time is mostly taken up, is as follows: The tree planting on Sugar Loaf. The propagating and attending to new species which we are raising from seed sent to us from abroad. The propagating and keeping in stock a supply of trees wanted by homesteaders, military organizations, plantation companies and others. Attending to the distribution and shipping of plants, answering letters of inquiry from people on the different islands, attending to the seed exchange and correspondence connected with same, etc. About one-half day out of every two days is spent with the men on Sugar Loaf. It is necessary to keep close tab on the men to get the best results. They are all Portuguese, none of them can sign their own names, and their knowledge of English is very limited. This kind of work was new to them all when they started with us and of course they have to be watched closely. This work I think should claim our first attention and all our efforts should be directed toward making this undertaking a great success. The trees are making a splendid growth and there is every indication that this piece of work will prove to be

one of the best achievements in the line of tree planting attempted by the Board in the past ten or twelve years.

The experimental work in connection with the introduction of new species is, in the writer's opinion, very important and demands our closest attention. With the assistance of one man to help plant and attend to the trees we can do a good deal in the way of testing out the different species of seed which we are receiving from Mr. Rock and through the exchange of seed which we conduct with a number of Botanical Gardens and other institutions in different parts of the globe. The raising and distributing of about half a million trees a year requires a good deal of attention as any person who has any idea of the business knows. The trees are shipped to places all over the different islands and letters and bills of lading have to be attended to. Only trees of the very best of their kind are sent out and the people now know that they can depend on getting what they ask for and the best at that.

By attending to the most important work and attending to it well, will, in my opinion, be the means of giving us more credit and do us more good than dabbling in too many jobs and not being able to attend to any of them, as they should be attended to.

Respectfully,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

April 9, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the division of hydrography during the month of March, 1914, is submitted:

Kauai.

Construction work on the Kalihiwai stream gaging station was completed and the register installed. Work on the new trail up the Lumahai stream to the new station site was started.

Complete rainfall data received show that 475 inches of rain fell on Waialeale (elevation 5080 feet) in 1913, against a total of 405 inches in 1912. Owing to the high cost of reading this station it will be temporarily discontinued during the fiscal year 1915.

Oahu.

Clock register stream measurement stations were constructed on the Punaluu, Kahana, and Haiku streams, and a staff gage

station was established on the East Branch of the Kahana stream. All of these streams were equipped with bridges on cables for flood measurements.

At the request of the Governor a reconnaissance was made of the Pauoa waters. A copy of this memorandum is attached hereto.

At the request of the Deputy Attorney General an opinion relative to the purchase of Pauoa waters, and to the future of Honolulu's water supply was furnished that officer. A copy of this letter is attached hereto.

Maui.

Only routine stream gaging and rainfall measurement work was undertaken. A set of discharge measurements was made on one of the West Maui ditches which disclosed the fact that the actual discharge was one and one-fourth million gallons per day more than was shown by the weir formula. As this water is sold at \$7.00 per million gallons these measurements have aroused considerable interest both to the seller and buyer of the water.

Personnel.

W. V. Hardy, in charge of Kauai, has been transferred to the California District of the U. S. Geological Survey.

J. C. Dort, former office engineer, will take charge of Kauai work after April 1, 1914.

G. R. White, field assistant, has been released.

Application for transfer for Howard Kimble, assistant engineer, from the Hawaiian Islands to the mainland has been requested of the Washington office of the U. S. Geological Survey to take effect June 30, 1914.

D. E. Horner, field assistant on Kauai, will be released on the completion of construction in hand, probably about June 30, 1914.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

MEMORANDUM FOR THE GOVERNOR.

Honolulu, T. H., March 14, 1914.

On March 12, 1914, the undersigned made a set of measurements of all springs of the Pauoa valley, and the following results were obtained:

1. Pauoa Stream above Pacific Heights intake and above all diversions, elevation 680 feet: dry.
2. Pauoa Stream, immediately below Pacific Heights intake (seepage and leakage from same), elevation 660 feet, 110,000 gallons 24 hours.

3. Pump House Spring, elevation 630 feet, 105,000 gallons 24 hours.

4. Kahuawai Spring, elevation 590 feet, 320,000 gallons 24 hours.

5. Kaikahi Spring, elevation 275 feet, 98,000 gallons 24 hours. There is no way of measuring the amount diverted by the Pacific Heights pipe line.

All of the above sources were being diverted by irrigation ditches. The stream below the road crossing at an elevation of about 250 feet being dry.

A comparison of these amounts of water with the amounts found previously show that the Pump House Spring (elevation 630 feet) and the Kahuawai Spring (elevation 590 feet) have decreased about ten per cent., while the Kaikahi Spring (elevation 275 feet) has decreased more than 60 per cent.

Extremely dry weather has prevailed, the February rainfall being extremely light. Indications point to even a smaller discharge from these springs during the coming summer and fall months.

As the season progresses, additional measurements will be made and the results furnished to you.

Attached hereto is a copy of a memorandum showing previous measurements.

G. K. LARRISON,
District Engineer.

MEMORANDUM RE BOOTH WATERS.

Spring No. 1.—Pacific Heights. Elevation, 670 feet; 46,000 gallons per day. Water from mauka, measured below Spring No. 1 so as to include leakage from No. 1, about 317,200 gallons per day. On April 6, 1911, W. F. Martin measured by current meter and found 519,000 gallons.

Spring No. 2.—Pump House Spring. Elevation, 630 feet. Spring considered by C. W. Booth better than Pacific Heights Spring No. 1, which has been confirmed by Baldwin & Alexander, 121,800 gallons. Measured by W. F. Martin April 6, 216,000 gallons.

Spring No. 3.—Kahuawai Spring. Elevation, 590 feet; 366,000 to 408,200 gallons per day. (Land does not belong to Booth.) Measured by W. F. Martin April 7, 1910, 349,000 gallons; measured by W. F. Martin April 6, 1910, 369,400 gallons. Reported on from data, Max Lorenz, March 4, 1905, 400,000 gallons.

Spring No. 4.—Elevation 320 feet, on Booth land; 19,000 gallons per day.

Spring No. 5.—Kaikahi Spring. Elevation, 275 feet; about 255,000 gallons per day. Second largest spring. Nov. 15, 1902,

Grimwood, Richardson & Holloway reported flow 253,700 gallons.
 April 15, 1910, W. F. Martin measured 375,000 gallons per day.

Summary.

Mauka sources	317,000	gallons
Spring No. 1.....	46,000	"
Spring No. 2.....	122,000	"
Spring No. 3.....	380,000	"
Spring No. 4.....	19,000	"
Spring No. 5.....	255,000	"
	<hr/>	
	1,139,000	"
With other waters about.....	1,200,000	"

The tenth successive year without a forest fire has just been passed by the Powell national forest in south central Utah.

Yellow poplar, or tulip tree, the largest broadleaf tree in America, has been known to reach nearly 200 feet in height and 10 feet in diameter.

Pennsylvania has about $7\frac{1}{2}$ million acres of timberland, one-eighth of which is owned by the state. The total value of the state's timber is 139 million dollars.

Mistletoe thrives on the western coasts to an extent not approached in the east. In many places this parasitic growth is responsible, directly or indirectly, for a considerable loss of timber.

Forest officers in Washington and Oregon plan to discontinue the use of barbed wire on their forests. This will affect their own pastures and public drift fences. They say barbed wire has no advantage over smooth wire, that it injures stock, and that it is more likely to be borne down by soft snow. Stockmen on the Ochoco forest, in Oregon, recently constructed drift fences of smooth wire, though with some misgivings; now they say they will never use barbed wire again.

ALFALFA—A PROMISING FORAGE CROP FOR HAWAII.

By WILLIAM H. MEINECKE, Class of 1913.

(Continued.)

The quantity of seed to be sown depends directly upon one of three conditions:

(1) If the purpose is the production of seed, the planting should be very light, from 5 to 10 pounds per acre being the general practice.

(2) The amount of available moisture, whether in the form of natural rainfall or irrigation water, is a very important factor as alfalfa requires a large amount of water. The dryer the region, the thinner the planting should be. The Indiana Station recommends the sowing of 10 to 15 pounds in dry regions.

(3) Where the conditions are optimum, the *method of planting* is the deciding factor, especially when the purpose is the production of hay or green fodder. Two methods are generally used, as follows:

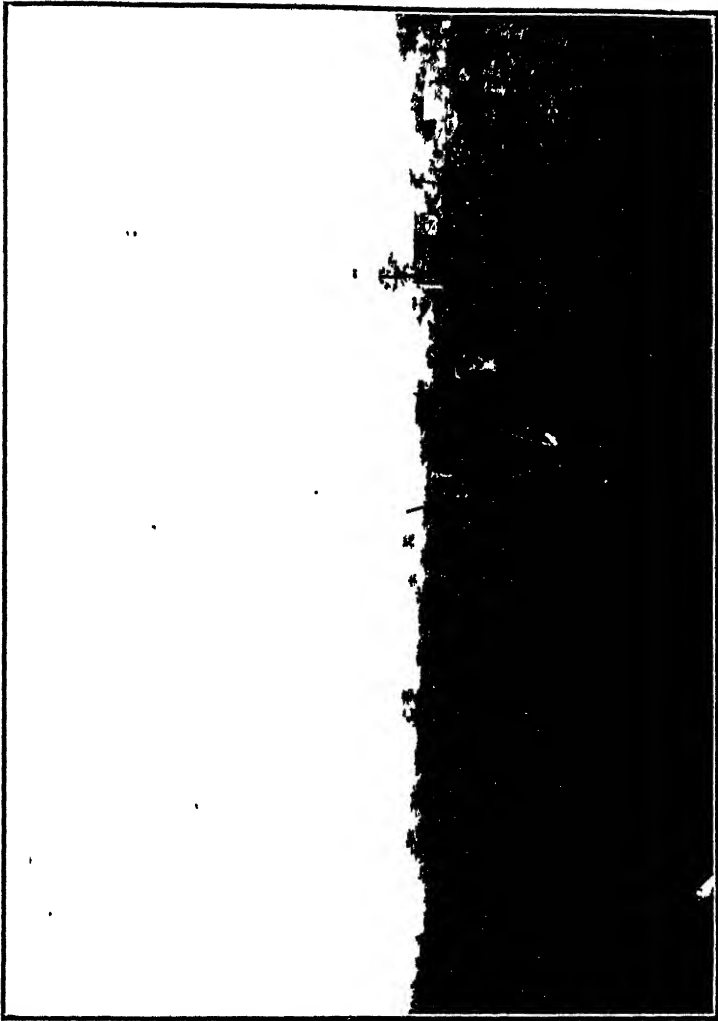
(a) *Broad Casting* requires from 18 to 30 pounds of seed per acre, Thos. Hunt⁶ recommending never less than 20. This is the casier method and is commonly practiced in many parts of the United States and also in Hawaii. However, it is an uneconomic method where there is apt to be an attack of weeds and insects, as it is very difficult to combat these enemies without destroying a large number of the young plants and after cultivation is impossible.

(b) *The Drill Method* is recommended in almost every State of the Union. This method is not only more economical of seed and secures a more uniform stand, but facilitates the combating of noxious weeds and insects and also cultivation without damaging a single plant. From 10 to 20 and even 25 and 30 pounds of seed per acre is generally recommended by the various experiment stations of the mainland, while the College of Hawaii experimental plots yielded very well at the rate of 15 pounds of seed per acre. The Molokai Ranch found 14 quarts or about 25 pounds per acre very successful.

An ordinary seed planter with an adjustment for onion seed will answer every purpose if handled judiciously. An excellent planter worthy of high recommendation is the "Planet Jr." for small fields. This tool has adjustable parts and may be used as a planter for any kind of seed up to corn and is also a very satisfactory cultivator for alfalfa. It is light, strong and easily handled, and is especially suited to rows one foot apart.

The distance apart of the rows seems to be generally one foot,

⁶ Forage and Fiber Crops in Hawaii.



Preparing the Ground for Alfalfa at College Farm, College of Hawaii, August 20, 1912.

though many planters have been successful with two foot rows, which facilitate the use of horse cultivators. For our Hawaiian conditions, one foot rows seem to be the best.

Wide spacing of rows means a greater chance for the encroachment of weeds, but where they are scant this may be worth consideration. Unfortunately the writer has found but one reference¹⁰ to the double row system of planting alfalfa. It was tried out at San Antonio, Texas, and found to be the best method.

¹⁰ U. S. D. A., B. P. I. Cir. 106.

double rows eight inches apart with a cultivated space of twenty-four inches between being used. This method has proved a decided success with pineapples in Hawaii, and is undoubtedly worthy of a few trials.

The Time of Seeding. Owing to the prevalence of cut worms, the fall months are safest for seeding alfalfa in Hawaii; August, September and October being the months recommended by the most successful growers. The seeds will grow well at any season of the year but the prevalence of cut worms is the only limiting factor where moisture conditions are favorable.

Treatment after the Crop is Established. Replanting is very often practiced and is to be highly recommended, as it fills in the gaps which would otherwise be occupied by weeds and also results in a more uniform stand.

Once the crop is established, it needs very little attention. If properly spaced it will cover almost the entire space and will thus keep down the weeds till the crop is harvested. Where irrigation is necessary, it should be done immediately following the harvest. A single heavy irrigation is better than two light ones, but one should be careful not to irrigate too heavily on heavy soils. Light cultivation immediately after harvesting to form a good mulch helps greatly in the preservation of moisture and in destroying what few weeds there may be in the soil and also helps the crop generally.

The most economical practice is to irrigate if at all as soon as the crop is off the field and then cultivate lightly as soon after as the land is in condition to form a good mulch. No other treatment is necessary if the seed bed has been properly prepared.

According to the Hawaii Station Bulletin 23, "The amount of water used varies greatly in different localities and by different growers. On the low sandy and gravelly soils of the lee side of Oahu, weekly floodings ranging from 50,000 gallons to more than twice that amount per acre, are found necessary during dry weather. On the more retentive mauka lands, as at Moanalua, 50,000 gallons and less applied fortnightly is found ample."

Harvesting. Different varieties of alfalfa mature anywhere from 18 to 30 days and even longer. In the central part of the United States, 3 to 4 crops are harvested annually while California generally harvests from 4 to 8 crops annually. Here in Hawaii, the common variety will produce 8 to 12 crops per annum, while the Arabian will produce about 18, since it is an earlier maturing variety. Covering a period of 18 months, there has been produced on the College farm an average of about 13 crops per annum.

Ordinarily the field is ready for harvesting when about one-tenth to one-fourth of it is in bloom, or when the lower leaves begin to wilt and turn yellow. Many varieties do not bloom well and may even start the new growth before the appearance of blossoms; such varieties are ready for the sickle as soon as the

new shoots begin to appear. As the leaves contain the greatest amount of food value, the crop should be harvested before they have begun to fall.

Fresh green alfalfa should not be piled up or stacked for any length of time, as it almost immediately begins to heat, and will spoil in a very short time. It should be spread out in the shade until a short time before feeding if it is to be fed green.

If the crop is to be ensilaged, it should be allowed to dry out a little before being placed in the silo, for it has been found that fresh, green, unwilted alfalfa will not make as good silage as that which has been allowed to become partially dry. Since it will not pack well unless it is chopped, one should not take the risk of packing it as it comes from the field. The crop must not be allowed to dry out enough to become brittle before being placed in the silo as it will fail to make good silage when in that condition.

While the silo has not yet come into general use in Hawaii, it has in most cases already proved a successful method of preserving green succulent fodder under Hawaiian conditions. And it is probable that its use will be greatly extended.

Although Mr. Pond was quite successful in making alfalfa hay and sold considerable baled hay, making has not been practiced in Hawaii except in an experimental way, because green feed is generally available throughout the year and it is therefore unnecessary to preserve our fodder.

However, alfalfa must be cut very soon after maturity as it cannot profitably be left in the field for more than a week. If the crop cannot be utilized or sold, the only profitable resort will be to turn it into silage or hay.

The making of alfalfa hay, as practiced on the mainland, is somewhat different from that of wheat hay, owing to the nature of the crop. On large farms kiln dried hay has proved economical, but it is not practical on smaller fields.

The crop is allowed to lie where it falls as it is cut and is turned over lightly once or twice during the day. It should be stacked or placed in the sack as soon as the stalks begin to become brittle and care must be taken in handling that too many leaves are not knocked off as they are the best part of the hay crop.

The Seed Crop is ready to be harvested when the majority of the seeds are mature. The crop is then cut close to the ground as usual, but it is stacked loosely and allowed to dry out, the unripe seeds meanwhile ripening in the stack. When the crop has become thoroughly dry and brittle, the seeds are removed. It is also a general practice to have a piece of cloth under the stack to catch any seeds that may have shattered, since these are invariably the plumpest and best seeds of all.

One crop will produce from eight-tenths to two and one-half bushels of seed. Calculating this at the legal rate of 60 pounds

per bushel, one may expect to get from 48 to 150 pounds of seed per acre.

ROTATIONS.

Alfalfa, being a perennial, will continue to produce good crops for several years. In some regions it has continued to produce good crops for from six to 10 years, and in California there are fields 40 years old still producing good yields. However, this is generally the exception, for in most cases the field will begin to decline in yield after the fourth year, and it has been found more profitable to replant soon after the yields begin to decline.

All up-to-date farmers practice rotation of crops, for by this method the fertility of the land is maintained and insect pests, diseases and weeds are more successfully combated.

Corn and other crops are especially benefited by a rotation with alfalfa. On new weedy land it is best to plant first a crop of corn or potatoes, which will leave the land almost free of weeds and also in good physical condition. Alfalfa will do very well after a corn crop and, by means of the nitrifying bacteria by which it is accompanied, the alfalfa crop following will, at the end of its period of growth, leave the soil more fertile and in better condition for the next crop.

Various methods and crops are used in rotations according to the natural adaptability of the soil and climate, but the following systems may be worthy of consideration by the dairyman:

- (1) Corn one year; potatoes two years; alfalfa three to four or more years.
- (2) Corn two years; alfalfa four or more years; corn two years.
- (3) Corn one year; potatoes one year; soy beans or cow peas one year; corn one year; alfalfa four or more years.
- (4) Sorghum two years; alfalfa four or more years; corn one year; cow peas one year.

It may be well to mention here that in general a legume is made to follow or alternate in the rotation with a non-leguminous plant, the choice of the varieties or species depending upon the natural environment, requirements of the market or farm, and also the prevalence of certain weeds, insects and fungous diseases.

WEEDS.

As mentioned above, weeds are the worst enemies of the young alfalfa plants, the dodder, yellow trefoil, bur clover, green foxtail and others being the most serious ones in the States. We do not have these weeds to combat in Hawaii, but we have worthy substitutes in the so-called "knot or onion grass," "Honohono," and the purcelain or "akulekule" (sometimes also called pig-weed).

"Rhodes grass" has also been found a serious pest where alfalfa is planted in fields formerly devoted to it, owing to the prevalence and persistence of its numerous underground stems.

(To be Continued.)

THE KALO IN HAWAII (IX).

By VAUGHAN MACCAUGHEY AND JOSEPH S. EMERSON.

(Continued)

CULTIVATION OF KALO IN OTHER PARTS OF THE WORLD.

MADEIRA.

The cultivation of kalo in the Madeira Islands is described by Mr. David Fairchild of the U. S. Dept. Agriculture. He visited Funchal in March, 1907, and writes as follows regarding the "*Igname*" (Madeiran name for kalo): "According to one of the green growers here . . . these *Ignames* sell for 3 cents to 4 cents a pound, while sweet potatoes sell for only 2 cents. Crop comes in February and ends in April. Keep well; yield about one-third that of sweet potatoes; plantations continually watered; planting at all times of the year; side root stocks or tubers removed and the central stock left to form a perpetual plantation. The growers in the country boil the tubers before bringing them to market. Then they are brought down from the hills in baskets and sold in this boiled condition for 5 pence (10 cents) a pound. They are very palatable and nourishing, I believe, and rank here as more of a delicacy than the sweet potato. Only two kinds are known here so far as I have ascertained." (U. S. D. A. Bur. Plant Industry Bul. 132, p. 59.) The two kinds are the "*Branca*" or white, and the "*T'ermilho*" or red variety. Mr. Fairchild reports that "there seems to be little preference given to either of these sorts . . . They are peeled or scraped, and then boiled three to four hours in salt water."

CHINA.

" . . . Seven species of the *Colocasia* are found native in Cochin China, two of which are edible ' ' . the *Colocasia indica* and the *Colocasia esculenta*, known to the natives as *Khoia mon sen* and *Khoia mon sap* respectively. The latter, which is by far the best species for food as well as in yield, includes two additional varieties, known as *Mon ding* and *Mon mink tia*. ' ' . The cultivation of the edible species should begin in March or April. They require a marshy soil and are planted in ridges like sweet potatoes, about 30 inches apart, with about twice that space between the ridges. Young offshoots from the bottom

of the plants are also used for plant propagation, and the time necessary to mature is six months. The tubers are eaten boiled, the same as the sweet potato, and a kind of flour is also made from them. The price is less than seven cents a pound." Mr. J. E. Conner, American Consul, Saigon, (Cochin China, May, 1908. (U. S. D. A. Bur. Plant Industry, Bul. 142, p. 35.)

SURINAM.

Mr. P. J. Cramer, Director of Agriculture, Paramaribo, Surinam, describes as follows the growing of various aroids (*Colocasia*, *Xanthosoma*, *Allocasia*), as follows:

"The aroids grown here for table use are wet-land crops insofar as they need more moisture in the soil than sweet potatoes and yams. They prefer a sandy loam with a thick layer of humus on the top, while a light shade is beneficial to their growth. On pure sand they do not thrive as well as the sweet potatoes and yams unless the ground is thickly mulched and lightly shaded.

"The aroids are planted in Surinam the whole year through. They are never flooded, for during the greater part of the year sufficient moisture is kept in the soil by the rains, and in the three very dry months (September, October and November) fresh water for irrigation purposes generally is not available in the cultivated part (the coast lands) of Surinam."

The *Colocasia* chiefly raised is a dasheen, known to the natives as "Sinensie-taya." The corms and tubers are non-acrid; upon cooking the flesh of the corms becomes very white, that of the tubers slightly violet colored. It is regarded as a rather poor table vegetable, becoming soft and slimy when cooked. (U. S. D. A. Bur. Plant Industry, Bul. 233, p. 29).

PLANT AND INSECT

The disease known as "taro rot" or "root rot" becomes prevalent when improper cultural methods are followed. The specific cause of the disease is not known. *Huli* cut from immature corms are especially liable to become diseased. The disease attacks the inner part of the corm, causing it to rot. Plants thus affected mature in an abnormally short time. The leaves develop yellow spots and are wrinkled in a characteristic manner. Planting *huli* from diseased plants; planting in fields where diseased plants have been recently grown; fertilizing with leaves from affected plants, and flooding the newly planted *huli* too soon,—these are common sources of taro rot.

The kalo plant is remarkably free from insect pests. It is occasionally attacked by plant lice, but the damage done is so inconsiderable as to be practically negligible.



COOKING THE KALO CORNUS.
 A crude method employed by Hawaiians nowadays instead of the old fashioned *imu*. Note the simple fire place; the kettle for steaming the corns, composed of two old wash tubs; and the coarse burlap covering the corns. In the rear is a portion of a Hawaiian family.

THE MAKING OF POI BY HAND.

This method, employed by Hawaiian and Chinese poi-makers, is a long and arduous one. The kalo corms are cleaned of roots, washed, and cooked for several hours. The cooking is done in large kettles, or in an *imu*. The *imu* is the characteristic Polynesian under-ground oven in which food is cooked by means of water-vapor heated by hot stones. Previous to the introduction of iron kettles into these islands from abroad the natives had no means of boiling their food. All the cooking of kalo for poi was done in the *imu*, wherein it was steamed underground.

In constructing an *imu* a hole a foot or so deep and three or four feet across is dug and lined with stones. A few stones are then placed on the bottom, and covered with fire-wood. The wood is ignited, and small stones are put onto the fire, and become very hot. After the fire has consumed all the wood the heated stones cover the bottom of the *imu*. Ki leaves are spread over these stones, the corms are piled onto the leaves, and are covered with more leaves. A large stick or post is sometimes temporarily set up in the center to preserve a hole and then the *imu* is covered, *kawawe*, with leaves and earth. A quantity of water is poured into the hole, which is then closed. The heated stones convert the water into steam, which cooks the kalo. Kalo but partly cooked is *mo'a uno'a* or *unounoa*, and when pounded the parts are easily scattered, *puchuchu*. Kalo partially cooked, so that the uncooked portions appear as white spots, is called *puhaaa*. Half-cooked kalo in general is *mo'a kolekole*. Baked kalo is *ai kupuu*; a bundle of cooked kalo partially pounded is *holo ai*.

The time for cooking depends upon the amount of kalo put into the *imu*. It varies from one hour for a small amount to five or six, for an unusually large *imu*. The average time is two and a half hours. After the cooking is complete, the top or covering of the *imu* is removed, and the corms are taken out. The skin is scraped from the corms by means of shells, (*opihi* or patella shells being deemed especially suitable), sticks, or knives. In this state the corms, called *ai paa*, solid food, while fresh are much esteemed. The *ai paa* may be either dried or pounded.

Sometimes the *ai paa* were sliced up and dried in the sun, furnishing a convenient and portable food called *ao*, suitable for long voyages and comparable to hard-tack. According to Andrews' Dictionary, "Sea-bread or army hard-bread was called *ao* by Hawaiians when they first saw it."

POUNDING THE POI.

If the corms are to be made into *ai pa'i* they are put onto a poi-tray or *poi-board*, *papa ku'i ai*, and pounded with stone pounders. This process is called *ku'i ai*, *kimo*, or *po'e*.

The *poi-board* is usually hewn from a single large plank, five



A near view of the cooking-apparatus. The fire place is built of smooth porous lava boulders.

or six inches thick, 24 to 30 inches wide, and three to six feet long. Any hard, close-grained wood, that could be obtained in pieces sufficiently large, is suitable for a *poi*-board. *Koa* and *ohia* were among the woods anciently used; to these in recent times has been added monkey-pod, mango and other introduced trees.

The short boards are used by men working alone; when the long boards are employed two men work together, one at each end.

The *poi*-pounder or pestle is fashioned from a piece of hard lava or coral rock, selected because of its proper weight and grain. It must be neither too heavy nor too light; it may be porous, but the vesicles must be small. In shape the pounder is like a thick, stubby pestle, the neck of convenient size to be gripped firmly by one hand; the face is markedly curved and very smooth. On the island of Kauai, other forms of *poi*-pounders were made, namely the ring-form, and the stirrup-form.

A small type of pounder, called *pohaku ku'i poi malú* was used by the common people in times of great scarcity, to avoid by the loud noise of pounding the preparation of food, lest others hearing should expect to share the *poi*.

This pounding of the *kalo* by hand, like the primitive methods of its cultivation, requires a large stock of patience, persistence, and muscular power. This work is always performed by the men; although the women participate in the subsequent mixing of the *poi*. The workman seats himself on the ground, his legs extended along either side of the *poi*-board. He has divested himself of all unnecessary clothing, in fact is usually nude to the waist, for it is important that the arms be perfectly free. At one side, close to him, is a pile of the cooked and cleaned corms, on the other side a container of water. The board immediately in front of him is well moistened with water, several corms are placed thereupon, and are mashed by short, quick strokes.

At every blow the pounder is lifted high in the air, the intensity of the blows increasing as more corms are added and the mass of partially pounded *kalo* gains in size. The face of the pounder is kept moist by water applied with the other hand between strokes. This prevents the *kalo* from sticking to the pounder. Corms which are tough are called *uaua*. Those water-soaked are *loliloli*, or *popo*. Of these terms *loliloli* is most commonly used; *popo* is stronger and signifies entire rottenness. Corms decayed below but with an upper portion still fit to use as food are *palalalo*. The white spots that appear in *ai paa* while being pounded are called *a*.

AI PA'I.

A firm, dough-like mass is the result of this continuous beating. In this state it is called *ai pa'i*, and will keep unchanged for some time. When desired for storage or transportation the *ai pa'i* was made with a minimum amount of water, and was tied up in



CORMS OF UADA READY FOR PEELING.

The burlap cover has been taken from the cooker, spread upon the ground, and the thoroughly steamed corms placed upon it, preparatory to peeling. Three different peeling tools are shown—an ordinary kitchen knife, largely used nowa days; a bit of coconut shell; and two limpet or patella shells, these latter being used in olden times.

ki leaves in bundles called *pa'i-ai* or *holo-ai*, according to the shape of the package. If of the ordinary shape, a flattened spheroid, they were called *pa'i-ai*, a bundle of food. These bundles are usually done up in *la'i*, ki leaves, but frequently an old flour bag was substituted when the *pa'i-ai* was to be sent to another island. When the bundles were somewhat larger and done up with greater care in the form of a cylinder, they are called *holo-ai*. Such bundles were usually covered with *la'i*, and often protected on the outside by a strong covering of *lauhala*, pandanus leaves. The valley of Waipio, Hawaii, formerly supplied the greater part of that island with *ai pa'i*. Much of this was transported by sea; often, however, the boats were unable to come to the shore on account of the high surf. At such times a score or more *holo-ai* were lashed together in the form of a raft and pulled through the waves to the boat waiting outside in the smoother water. So firmly were these bundles secured in their protecting envelopes that the food within was none the worse for the external wetting in salt water. When loaded on donkeys and mules the *holo-ai* was regarded as a more convenient form for packing than the ordinary *pa'i-ai*.

Loose bundles of *ai pa'i*, not properly secured, so that the poi escapes, are called *ponununu*. Sometimes the two bundles, *holo-ai*, put upon the pack-horse, do not properly balance each other and need to be readjusted. This lack of balance is called *oloolo*.

Before steamers had replaced the sailing craft of a former day the inter-island delivery of native food was often seriously delayed, and the *pa'i-ai* became *mahumahu*, that is parts of it were bad from exposure to the air, and it could not be made into good *poi*. The proper remedy in all such cases was to place the bundles of food in a native *imu*, and steam them over again. On taking them out they were in such condition that they were readily made into good *poi*. Often, however, the native food was so scarce and difficult to obtain that wheat flour was made into a thick paste, enclosed in a flour-bag and boiled. This was mixed in with native food and used as a substitute for pure *poi*. In extreme cases where *ai-pa'i* was not obtainable, wheat flour thus prepared without any admixture would be the only *poi* used for a long time. *Poi* is also made from breadfruit, sweet potatoes, and sometimes from pumpkins.

POI.

Poi is made by pounding *ai-pa'i* and adding water until it has acquired a smooth, fine-grained and somewhat fluid, *uouo*, consistency. Bundles of pounded *poi* made into soft poi were called *popo-ai* or *ai-lau*. *Poi*, which has been well pounded, so that it is fine without lumps, is *acac*, *wali maika'i*, or *uouo*. If not well pounded it is *puu-puu*.

Hu means to rise or swell up, like new *poi*. *Wiliu* or *au*



CLEANING THE CORNS.

Four natives cleaning the corns; the women are dressed in *holoku*. Note the three metal vessels containing water for washing the peeled corns, and the three wooden bowls, (*umek*), for receiving the cleaned corns. The cooking process thoroughly softens the bark, so that it is easily removed.

means the circular motion of the hand in stirring *poi*. *Uuluhaku* means to stir *poi* like a lazy man, hence the *poi* will be lumpy. *Poi* that is not well-pounded and therefore full of lumps, which cannot be removed by careful mixing, is said to be *puupuu*, a much stronger term than *haku**haku*. When the lumps in *poi* are fine, like sand, it is *oncone*.

Mild acetic fermentation gradually takes place, so that the fresh, sweet *poi*, called *pololci* or *okaokai*, becomes slowly changed to the older sour *poi* or *poi awaawa*.

Among the Polynesians *poi* is universally eaten with the fingers. According to the amount of water with which it is diluted it becomes "one-finger," "two-finger," or "three-finger" *poi*, this criterion being that of the number of fingers required in eating it. When *poi* has been successfully pounded and mixed it can be readily transferred from the container to the mouth by one or sometimes two fingers. The act of transferral is called *miki*, the dextrous twirl given to the finger in the *poi* to make it adhere properly before carrying it to the mouth is *koai*. *Miki pakahi* indicates the use of one finger; *miki palua* the use of two fingers, and *miki pakolu*, the use of three fingers. If the *poi* is so thin as to require three or more fingers it is better form to fill a small *umcke* and pour its contents down into the wide-open mouth. This act is called *kau*, and is performed with great dexterity. The skill with which a well-bred chief was able to dispose of a large quantity of *poi* in one *kau* was called *miki oi*. Only a *kanaka hauka'i*, "a careless fellow," would use his fingers in eating thin *poi*.

If a person in eating from a bowl of poorly mixed *poi*, shuns the lumpy part and seeks out the better part, this action may be called *aloalo*, "dodging the lumps." When a person is too lazy to have his food properly prepared, or to clean his fingers before eating, or eats in a dirty manner and then leaves the food without care he is called *he kanaka pono-ai*, "one who eats like a pig."

Hoo-wali is the process of mixing *poi* with the hand in the calabash; *wiliau* is the final process of the *hoo-wali*. If the *poi* adheres to the side of the calabash after this mixing, the sides of the calabash are cleaned by a circular motion of the hand. This motion is called *kahi*, and is a conventional signal on the part of the host or hostess, at a meal, that the eating is at an end. To *kahi* before the guests have all finished is *pi*, mean or very bad form.

Thin, watery *poi* is called *kalc*, *kakalc*, or *kalcalc*. *Piholoholo* is a thin kind of *poi* made for the sick; it is like the ordinary *poi* "cocktail" of the foreigner, save that it contains neither milk nor sugar.

UMEKE.

The *poi* was kept either in wooden bowls or calabashes. The bowls, *umcke*, were hewn from solid blocks, usually of *kou*, *koa*,



CLEANING THE CORMS.
A nearer view. Note the curved bit of coconut shell in the hand of the woman to the extreme left.

milo, or *kamani*. They were sometimes very large, three or four feet in diameter, but the common forms were of moderate size. The highly polished bowls common in the curio stores now-a-days are not genuine antiques, but are either turned on lathes, or are old Hawaiian bowls that have been recently polished and finished in a manner wholly unknown to the ancient Hawaiians.

The calabashes or gourds were the prepared fruits of certain tropical vines. There were two species of gourd commonly cultivated by the ancient Hawaiians. The *ipu*, *Lagenaria vulgaris*, is the familiar "bottle gourd." This plant, according to Hillebrand, "is cultivated or naturalized in most tropical countries.

. . . The hard woody shell of the fruit served for containers in their households, while the largest gourds were converted into drums for use during their dances. The drastic pulp and seeds were a favorite medicine in the hands of the kahunas, although by no means free from danger"

The other gourd is *ipu nui*, *Cucurbita maxima*, and is the "calabash" or "large gourd." The Hawaiians were apparently the only people of Polynesia familiar with this gourd before the coming of foreigners. This fruit sometimes attains a diameter of several feet. These gourds were used as containers for *poi*, water, clothing, and other materials.

(To be concluded.)



IMPLEMENTS USED IN MAKING POI.

Observe the poi board; the stone pestle; the pail of water used in wetting the pestle and giving the poi the proper consistency; the *umcke* filled with fresh poi. The mat is woven of pandanus (*hata*) leaves.

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DIVISION OF ANIMAL INDUSTRY.

ANNUAL REPORT FOR YEAR 1913.

Honolulu, December 31, 1913.

The Honorable the Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I have the honor to submit herewith my report as Superintendent of Animal Industry and Territorial Veterinarian for the year ending December 31, 1913.

As all routine and detail work has been recorded in the twelve monthly reports of my Division it has been my aim in this report to show the present status of live stock conditions in the Territory in order to emphasize what has been accomplished during the nine years I have had the honor to be the head of the Division of Animal Industry.

Very respectfully,

VICTOR A. NORGARD,
Territorial Veterinarian.

REPORT OF THE TERRITORIAL VETERINARIAN—1913

THE LIVE STOCK INDUSTRY OF THE TERRITORY.

The year ending December 31, 1913, must be said to have been in most respects favorable to the live stock interests throughout the Territory. The prolonged drought of the previous year extended well into the spring or summer of 1913 and the feed on the ranges became very short, but with the improved water supply of nearly all the stock breeding districts the losses from this cause were comparatively small.

The vast increase in the consumption of beef and other meats, as a result of the great number of soldiers now stationed here, necessitated the importation of large amounts of beef and mutton from California, as well as from the Colonies, but the expected reduction in price from the removal of the duty on live stock products did not materialize, the foreign exporters advancing the

price in direct proportion to the reduction and pocketing the profit that was to have benefited the local consumers.

The past year has seen the sheep industry reduced to a considerable extent in favor of cattle raising, it being generally believed that many of the sheep ranges have been overstocked and consequently worn out, at least in so far as sheep are concerned.

No epidemic of any kind has occurred among either cattle or sheep, but for the first time in four years a considerable number of hogs have been lost from cholera, especially on the Island of Oahu, thereby necessitating the importation of butcher hogs from California. Previous to 1908 this Territory imported annually from 4000 to 6000 butcher hogs, and pork was always a very expensive meat on the local markets. Hog raising was consequently encouraged and urged at every opportunity by the federal, territorial and local live stock authorities until the production of hogs increased to the point when importations were no longer necessary. This condition lasted, as stated, for four years, or until the latter part of 1913, when a shipment of 200 hogs arrived here from Oregon. There is, however, little cause to believe that this condition will last for any length of time. The outbreak of hog cholera was under control shortly after its presence was definitely established, and were it not for the persistence of the infection for about six months after the last case had occurred in any locality it would soon have been safe for the hog raisers to begin to stock up again, at least with serum-immunized hogs. But, in any case, it has been demonstrated that hog raising is a very profitable business in this Territory, at least to the extent where cheap feed (hotel, mess or kitchen swill) can be obtained, and, further, that there is now a sufficient amount of that feed here to supply the local demand for pork.

Horse and Mule Breeding has taken an immense upward swing during the past few years and it is highly satisfactory to report that the past year has demonstrated the absolute fitness, or rather superiority, of locally raised horses for all the branches of the military service stationed here. About three years ago the cavalry began experimenting with Parker Ranch horses, first as polo ponies and then as regular mounts and officers' chargers, since which time about 200 head of horses have been purchased on various ranches on Hawaii and are giving great satisfaction. It may therefore be safely predicted that no more horses will be sent here for military purposes, but that the future needs of the regiments stationed here will be supplied by the local horse breeders. The only possible objection to such an arrangement might be the price asked for Island-bred horses, as there remain but few of the cheap cow-ponies of common-breed stock. All the larger breeders now use only pedigreed stallions of high class, and the colts and young animals are no longer left to care for themselves on the ranges at all times of the year, but are fed, broken and handled and, in fact, looked after and cared for, selected and classified

until they can hardly be called range horses any longer; and, as a steadily increasing percentage shows all the qualities and marks of high breeding seen in the blue grass regions of the States, it is obvious that they cannot be sold at the figures which prevailed five to ten years ago. As regards the health of the horse stock it must be said to have never been better. A few scattered cases of spinal meningitis—so-called—have occurred, on Maui and Molokai principally, but beyond these there has not been one outbreak of infectious or contagious disease worth mentioning. Two cases of suspected glanders in the same stable were reported from Hawaii, but as this was in a neighborhood where glanders had not occurred for many years, and quite isolated, it is more likely to have been epizootic lymphangitis.

IMPORTATIONS OF LIVE STOCK.

The following numbers of different classes of live stock have been received through the ports of Honolulu and Hilo during the past year:

	Honolulu	Hilo
Horses	550	6
Mules	710	6
Cattle	93	42
Sheep	2	42
Swine	227	11
Dogs and cats	75	11
Poultry (crates)	1330	127

From the above table it will be seen that by far the greater number of live stock enters the Territory through the port of Honolulu. Direct importations to the Island of Maui are included in the Honolulu record, since they all arrive here first and are inspected before being passed on to Maui, for quarantine or otherwise.

Of the 1200 to 1300 head of horse stock which arrived here during the year by far the greater part, that is, more than one thousand, were for military purposes. Of the remaining number most were draft horses of medium quality, and finally a number of stallions and mares for breeding purposes. Among these must be mentioned an importation of six black Percheron stallions and mares for the Parker Ranch, which undoubtedly will put their mark on many of the coming generations of heavy draft horses for which this ranch is so justly noted.

Among the cattle imported must be mentioned a bunch of five "Dutch Belted" cattle, the first seen here of that breed, and which were purchased by Mrs. B. M. Allen at the California State Fair, where they were prize winners. There also arrived a number of good bulls of the beef breeds but not by far as many as the Territory needs. Quite a number of the larger ranch owners are

exceedingly slow when it comes to improving their herds through the purchase of high class pedigreed sires, and seem to think that the end may be gained as well through the use of one-half, three-quarter or seven-eighth cross-bred bulls, many of which can now be purchased here, and some of which are splendid individuals besides costing much less than pure-bred animals. These breeders, however, do not realize that such animals lack that unfailing breeding potency inherent in the pure-bred sire of an old established breed, and which makes even the first cross with a common-bred cow worth twice as much and mature a year earlier than the offspring of a cross-bred or common sire with the same class of mother. It may be argued that the local market does not call for such heavy heeves or for such large cuts as those resulting from 1500 lb. steers, but that is simply because the consumers have become used to the smaller cuts and never have had an opportunity to learn that the larger the cut the smaller the waste. Another discouraging feature in this connection is the present system of the wholesale trade in butcher animals, all of which are practically bought on the block, that is, after they are butchered, and very rarely on the hoof, as is done everywhere else. This throws the entire loss from shrinkage—from the time a steer leaves the pasture until it has been butchered, bled and well drained, in many cases more than a week—on the stock grower, and the quality of the carcass, so apparent in the live animal in the feed yard or on the range, becomes almost insignificant. Whereas, for instance, a bunch of high grade Hereford or Shorthorn steers in the stables averaging 1400 or 1500 lbs. would bring the top market price, say seven or eight cents per pound on the hoof, a bunch of fat common-bred steers of all colors but fairly even size and weighing about 1100 pounds would bring at best five to six cents per pound. In the local market, however, the ranchman ships his cattle to Honolulu, taking them off the pasture and after a strenuous trip landing them in the slaughterhouse pens, where they remain until butchered, getting nothing but dry hay and water, a procedure which is obviously much more trying on well-bred cattle than on scrub stock and, as stated, when the final deal is made the carcass of the latter will in most cases bring as much as the former and possibly be preferred on account of their smaller size, the larger carcasses being classified as stags even if they average a year younger than the others. So long as this condition continues there is little incentive for the progressive cattle raiser to improve his herd with expensive sires and only concerted action on their part for the sale of the live animals to be consummated either on the ranch before shipment or else immediately after arrival in Honolulu, will give the producer of high class beef his just dues, and help to elevate the live stock industry to the standpoint which the ideal climatic conditions and the almost total absence of diseases of live stock warrant.

QUARANTINE STATIONS.

In connection with the importation of live stock and the above mentioned absence of disease, it is worthy of note that the Board has done everything in its power not alone to guard against the introduction of infected animals, but also to facilitate the importation of valuable breeding animals and assist the progressive stock breeder in bringing such into the Territory with as little cost and inconvenience as possible. To this end two ports of entry besides Honolulu, that is, Hilo and Kahului, were during the past year provided with quarantine stations. The Hilo station cost nearly \$3000 and the Kahului Station about half of that amount, besides which the Board provided a permanent caretaker for each. Both stations are of solid construction and absolutely modern in so far as sanitation and hygiene, as well as comfort and convenience, are concerned. The old quarantine station at Hilo was at best a makeshift affair, while importations of live stock for the Island of Maui had to be quarantined, when required, at Honolulu, and were it not for the uncertainty engendered through the change in the national administration, these improvements would undoubtedly have seen a great increase in the numbers of draft and breeding animals imported. The observations made by this Division during the past eight years have however demonstrated beyond a doubt that so long as new centers of infection are prevented from gaining entrance it is possible to eradicate the infection already established here. The following section of this report, dealing with glanders, shows this most clearly and accentuates the necessity for continuing the policy of vigilance embodied in the Board's regulations requiring inspection, testing and quarantine of all live stock coming from or through a state, territory or country known to be infected with one or more of the numerous animal scourges from which the Territory now is free.

DISEASES OF LIVE STOCK.

Glanders. It is with considerable satisfaction that this Division believes itself justified in claiming that glanders, the most destructive of all equine diseases, has apparently been eradicated from the Territory, especially in view of the fact that the disease was very prevalent here when the Division was established about nine years ago, and that no indemnity has ever been paid for destroyed animals. This is a feat which the best live stock sanitarians have claimed to be impossible and one that has not been accomplished anywhere else in the civilized world. It must, however, be said that it would have been nearly as difficult here had it not been for certain natural, especially climatic, conditions and resulting circumstances, all of which tended to favor the efforts at eradication. The prime factor, however, was the exclusion of

fresh infection with horses and mules imported from or through California and other countries. Owing to the great distance of these Islands from the mainland, and to the absolute necessity of importing large numbers of draft animals from the nearest available market, that is, California, it seemed to have become a habit with horse dealers there to unload on Hawaiian buyers latent or obscure cases of glanders, taking it for granted that the diseased animals could not be returned and that, if returned, they would not be admitted to the State but would have to be destroyed upon return arrival. It seemed therefore to be perfectly safe to ship such animals to Hawaii, and, until the mallein test came into general use, there can be little doubt that many reactors found their way to this Territory. No wonder therefore that glanders spread through the local stables and pastures until over one hundred outbreaks per annum became the rule rather than the exception and that the losses from this disease alone at times aggregated \$30,000 per year.

With the establishment of the Division of Animal Industry in 1905 a check was immediately put upon the importation of infected animals, although it was not until the coöperation of the federal Bureau of Animal Industry was enlisted in 1907 that a complete stop may be said to have been effected. This policy of the Territorial Board of Agriculture and Forestry, to demand and obtain federal protection in the interstate shipment of live stock, was soon followed by other states and territories until at the present time it is universally employed throughout the Union, and the regulations of this Board pertaining to the importation of live stock have been adopted, and in some cases copied word for word, by a number of the States.

At the same time a vigorous fight against the disease within the Territory was inaugurated and this again led to the appointment of deputy territorial veterinarians on the principal islands, without which the creditable result, that is, the apparently complete eradication of the disease, could not have been accomplished in such a short time, and especially without the payment of compensation for destroyed animals. It is, of course, not impossible that the disease may linger in some out-of-the-way mountain valley or gulch or remain latent in some old "carrier," as was the case in Waipio Valley, but even so if another outbreak should occur it will soon be apprehended and suppressed, while the intradermal test with mallein is so easy and simple that all exposed animals can be located and rendered harmless with comparative ease.

Bovine Tuberculosis.

What has been said above in regard to glanders in horse stock may to a certain extent be repeated in so far as bovine tuberculosis is concerned. What has been accomplished here along the line of control, suppression and eradication of this fatal insidious disease of dairy cattle and the resulting improvement of the local

milk supply is unparalleled in any other country, state or territory where no indemnification is provided for the destruction of diseased cattle, and where the enforcement of sanitary regulations is in the hands of political employees.

Beginning four years ago with the tuberculin testing of the dairy cows of the City of Honolulu conditions were met of sufficient severity to discourage the stoutest heart, and, had it not been for the unfailing support of the leading dairymen and their willingness to sacrifice large numbers of their best animals, it is doubtful whether the present satisfactory state could ever have been reached or, at least, not until the milk consumers had been educated up to demand pure and wholesome milk for their children.

The first tuberculin test revealed no less than 32% of diseased cows among the Honolulu dairy herds, which figure was reduced to 24% when all the dairy cattle of the City and County of Honolulu, that is the Island of Oahu, were tested, and it cannot be disputed that had the test been postponed even one single year the question of eradication would have had to be abandoned and either pasteurization or the "Bang method" of gradual elimination resorted to. But as it was, by far the greater part of the 469 head of reactors to this first test belonged to three or four of the largest dairymen, who were financially able to bear the loss and who declared themselves willing or even anxious to have their herds cleaned up. There was consequently nothing else for the recalcitrants to do than to follow this step or else go out of the dairy business, as the milk consumers were quick to respond to the movement for sanitary dairies and clean milk and refused to buy from any dairy that was not declared clean officially, even though there was a slight advance in the price of milk from the clean herds.

In the latter part of 1910 (November), the intradermal method of testing was adopted, whereby the greater part of the objection to the work of eradication was overcome. This method, fully described in the previous reports from this Division, has proved absolutely satisfactory and is fully believed to be the only means whereby the universal eradication of bovine tuberculosis can ever be accomplished.

The second and third annual tests gave respectively 5.8% and 3.8% of reactors whereas the 1913 test, comprising 4444 head of cattle, gave only 119 reactors of which a great part were range cattle that had escaped the previous tests and about $1\frac{1}{2}\%$ were actual dairy cows. All of these reactors were slaughtered without unnecessary delay and, whenever possible, examined post mortem. In every case did the pathological changes verify the diagnosis and prove the value of the intradermal method of testing. All stables where reactors were found were thoroughly disinfected and whitewashed, and these herds are now being submitted to the test every three months in order to apprehend any

case, that may still develop, in its incipency. In the meantime it may be said that the milk supply of the City and County of Honolulu, to all intents and purposes, is free from tuberculous infection and it is to be hoped that this good work which has only recently been inaugurated on the other islands, where deputy territorial veterinarians are located, will progress and meet with the same support from the public as has been the case here. Up to the present time the efforts of this Board to do its share in fighting the Great White Plague by suppressing the one source of infantile tuberculous infection that we know *can* be suppressed.—viz., the milk-borne infection—has met with but lukewarm support from the municipal authorities in this county and none at all in the other counties, while the Territorial Board of Health is doing splendid work all over the Territory fighting the spread of the disease among all classes and nationalities of the population. Whether the efforts of the Board of Agriculture and Forestry along these lines are of any actual value in saving human lives has frequently been disputed, but knowing as we do that children under five years of age are especially susceptible to the bovine tuberculous infection, so often contained in milk from tuberculous cows, the Board of Health was asked for statistics in regard to the mortality among children from tuberculosis in Honolulu as compared to the rest of the Territory, during the period of the last three years. The report received covers the number of cases, with the number of deaths, of all forms of tuberculosis among children under five years of age, in the entire Territory and in the district of Honolulu alone, and proves clearly that there has been a decrease in the number of cases in Honolulu since 1910, of more than 66%, or to one-third of the annual number of cases, while the number of deaths has decreased more than 75%, or to one-fourth of the annual number of deaths. On the other hand the number of cases for the entire Territory shows an increase of 40% and the mortality an increase of 80% per annum. These figures cover the period from April, 1910, to June, 1913, with a total of 102 cases of infantile tuberculosis with 90 deaths, of which number 50 cases with 35 deaths occurred in Honolulu. But whereas the last year, ending June 30, 1913, gave the entire Territory 36 cases with 32 deaths, the District of Honolulu had only 9 cases with 5 deaths, which warrants the conclusion that some extraordinary factor must have contributed to this immense reduction in the local prevalence of the disease which it would not seem far-fetched to attribute, at least in part, to the absence of the specific infection, the tubercle bacillus from the local milk supply, especially as milk forms such an important part of the food of children under five years of age.

By this inference it is not meant to take an iota of credit away from the splendid work done by the Anti-Tuberculosis League of Hawaii and the Territorial Board of Health, but an analysis of the statistics contained in the pamphlet published by the

League (Advertiser, December 20, 1913), shows a *reduction* in the death rate from tuberculosis of all classes and ages (1911-1913) of from 3.5 per 1000 to 2.7 per 1000 inhabitants, which makes the *increase* in mortality among children under five years of age except in the one district where non-tuberculous milk is available, so much more conspicuous, and forcibly accentuates the fact that the said pamphlet, entitled "Fighting the Great White Plague in Hawaii," in no place on its fourteen pages mentions either cows or milk or the danger of transmission of bovine tuberculosis to children with infected milk, but simply ignores the efforts of this Board to assist in the fight along the lines which are now recognized the world over, that is, the eradication of the tuberculous cow. This statement is made with regret as there can be little doubt that, had the League embodied in its educational campaign a single paragraph urging the necessity of providing the children with milk from healthy tuberculin-tested cows, the milk producers all over the Territory would long ago have been forced to clean up their herds and stables in spite of the lethargy of the various municipal sanitary authorities, and more than a few lives might have been saved.

To attempt to eradicate human tuberculosis while the children are being fed milk from tuberculous cows is futile. Consequently the first step must be the eradication of bovine tuberculosis, and that can only be accomplished by teaching the parents the danger of tuberculous milk. Pasteurization cannot be relied on, especially not home pasteurization. To protect the children the parents must therefore refuse to buy milk from any but tuberculin tested cows, guaranteed professionally or preferably officially, to be free from the disease and kept in sanitary surroundings. The first dairyman in Honolulu to receive a clean bill of health from this Board found the demand for his milk doubled within one month even though he advanced the price from 10 cents to 12½ cents per quart. There are at the present time few families left where tuberculosis has not claimed one or more victims, and no mother will, after once being taught the danger, willingly buy milk from untested or diseased cows if wholesome milk can at all be obtained for her children.

There is consequently no reason why any individual or any community should wait for official action in order to get clean milk. In every district or community there is at least one dairyman who has a clean herd or who is progressive enough to clean up his herd the moment there is any agitation for clean milk, and it may safely be said that an application from a dairyman to have his herd tested and cleaned up, addressed to the proper local authorities, would hardly be denied at the present time. If it should be denied there is still the practicing veterinarian, who, if he is at all progressive, is the one who should take the initiative in every district or community where the authorities are slow about attacking the problem.

Bovine tuberculosis must go first, but to await its eradication through the promulgation of laws, ordinances and regulations which necessarily must carry large appropriations to become effective is futile. Action must come from below and not from above. It therefore rests with either the consumer, the milk producer or the local veterinarian to start the ball rolling and, as it is the milk consumer who is to reap the greatest benefit from the improvement, it is only reasonable that the consumer should pay for it. And what would the cost amount to? An advance of one cent per quart of milk would in one year pay the full value of every tuberculous cow in the United States and besides leave a handsome profit for the producer as well as pay for the work of the veterinarian. In accordance with statistics furnished by the Hygienic Laboratory (Bulletin No. 56) of the U. S. Public Health and Marine Hospital Service there were consumed in the United States in the year 1900 (12th census) no less than 740,000,000 gallons of milk and cream by the urban and suburban population alone—that is, this enormous quantity was sold by the milk producers and did not include what was consumed on the farm and what was used in the manufacture of butter, cheese, condensed milk, etc. This amounts to about 23 gallons a year for each person. The consumption of milk in Philadelphia during the year 1905 was estimated at 23 gallons for each inhabitant or an average of half a pint per day for each person. The daily consumption of milk in Honolulu aggregates 6000 quarts, so an advance of one cent per quart would mean \$60 per day or \$21,900 per annum. This sum would, and probably has, fully reimbursed the milk producers in the City and County of Honolulu if taken as a whole, since the bovine tuberculosis work began in 1910, for losses sustained through the destruction of diseased animals, and it has been paid without objection by the milk consumers. It will therefore be seen that if the annual consumption of milk in Honolulu averages 23 gallons or about 100 quarts per head as in Philadelphia, the insurance against tuberculous infection through cows' milk would, at an advance of one cent per quart, have cost the consumers on an average one dollar per annum each.

In conclusion it may be stated that the intradermal test is slowly but surely gaining ground, at least four States using it officially and many others experimenting with it. In California it is now used almost exclusively by the live stock sanitary authorities, even though it is admitted that considerable practice is required before the veterinarian in general can be trusted with it.

Preventive Measures Against Rabies.

It is now nearly two years since the regulation requiring the quarantining of all dogs coming from or through territory infected with rabies went into effect.

While the measure has met with a considerable amount of more or less pertinent criticism it cannot be said to have been actually opposed and it is doubtful whether a single dog, if at all worth while, has been left behind on that account.

The actual number of dogs imported or arriving here with tourists or returning residents fell during 1913 to 75 head as compared with 106 during 1912 and 132 in 1911, but this reduction is due principally to an official order restricting the number of pets and mascots which usually arrived here with every regiment, company or troop that was to be stationed here. During the past year only officers' dogs have been allowed to accompany the various contingents of soldiers arriving here, thereby eliminating a great number of more or less worthless dogs which otherwise would have crowded the quarantine station for four months each. Another cause for the reduction is due in part to the strict six months' quarantine maintained in Australia and New Zealand which in conjunction with the local quarantine prevents theatrical companies, such as dog and monkey shows, from bringing performing animals to any of these countries or which at least makes it so expensive and annoying to the managers that they have practically abandoned the Hawaii, New Zealand, Australian circuit which formerly concluded such companies' tour of the world. In 1911 for instance more than 33 per cent. of the dogs arriving here consisted of soldiers' pets and performing dogs. That the dog quarantine regulation has proved effective in keeping the disease out until this time is very gratifying, especially when considering that the epidemic prevailing in the Pacific Coast States, so far from being suppressed, is constantly on the increase, and, while a number of attempts have been made to willfully circumvent the regulation and land dogs here regardless of the quarantine requirements, it is believed that no such attempt has so far been successful, and it is sincerely to be hoped that common sense will prevail among both tourists and resident dog owners and make them realize the awful responsibility they assume in attempting or conniving at the introduction of a dog without quarantine. The last case reported to the Board, from Hayward, California, where one rabid dog bit six persons, a couple of horses and more than twenty other dogs in less than an hour, before it was cornered and shot, furnishes a good illustration of what might happen in this dog-infested district, should the disease gain an entrance here. In the first place it would be necessary to establish a Pasteur institute here for the preparation of the vaccine and the treatment of bitten persons, a matter of several thousand dollars, and the employment of at least one expert scientist and assistant. California now has seven such official institutions and a number of private ones, in which hundreds of people are being treated annually. But before such laboratory and clinic could be established here it would be necessary to send all bitten persons to San Francisco, in many cases at public ex-

pense, and, owing to the distance and length of time required to get there—in some cases ten to twelve days—at great risk to the life of the patient. There is consequently every reason why this preventive measure of the Board, the dog quarantine, should receive the full support of the public as well as of the press. To recommend that a Pasteur laboratory be established here before the actual appearance of the disease would probably be futile, besides which it is a matter for the consideration of the Territorial Board of Health exclusively. But there can be no doubt that the disease *may* gain entrance here in spite of every precaution taken, and, if this calamity should occur, the question will immediately be raised, Why was nothing done in time, when we had the disease next door to us?

SUMMARY.

Summing up the results of the year's work it may be stated:

(1) That inspection and testing of all classes of domestic animals before or upon arrival here, and the enforcement of the various quarantine regulations, have again proved effective in preventing the introduction of any of the many diseases of live stock and other domestic animals so prevalent on the mainland of the United States or in its colonies and other countries.

(2) That glanders among horses and mules, which formerly caused a greater loss than all other diseases of live stock combined, has been practically wiped out, only one doubtful outbreak, affecting two animals, having occurred during the year, as compared to a hundred outbreaks annually a few years ago.

(3) That bovine tuberculosis has been reduced to a minimum among the dairy cattle in the City and County of Honolulu and bovine tuberculous infection removed from the milk supply in that district, which work coincides with a reduction of 50% in the mortality among children under five years of age from all forms of tuberculosis, as compared with an increase of 80% in the rest of the Territory where tuberculous cows are still being milked and the milk fed to the children (facts based on Board of Health records).

(4) That the eradication of bovine tuberculosis on the other islands is being pushed as fast as the deputy territorial veterinarians can do it and the local health authorities and the milk producers and consumers will furnish and support it, and finally—

(5) That the live stock industry of the Territory is prospering under the natural and unparalleled favorable conditions and unprecedented freedom from infectious and contagious diseases of animals, results and conditions which have placed the Territory among the leaders in live stock sanitary work and caused a number of States in the Union to emulate or copy the policies, methods and regulations of this Board.

Respectfully submitted,

VICTOR A. NORGAARD,
Superintendent of Animal Industry and Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

ANNUAL REPORT.

Honolulu, December 31, 1913.

Board of Commissioners of Agriculture and Forestry,
Honolulu.

Gentlemen:—I have the honor to submit herewith a brief report covering the various lines of work carried on by the Division of Entomology during the calendar year, 1913.

The principal and most important work of my Division during the year consisted of the usual quarantine inspection of all agricultural and horticultural products which were shipped into the Territory from the mainland and foreign countries. In addition to this work, a thorough inspection of all fruits, vegetables and plants going from the Island of Oahu to the other islands has been carried on during this period. There was also attached to this general work the introduction, care and distribution of several parasites of the Mediterranean fruitfly and the hornfly. This work, although connected with my Division, was under the direct supervision of W. M. Giffard, Esq., president of the Board of Agriculture and Forestry, and only on special occasions were my services required. The personnel of this branch, as well as a review of the work done, has been published in Bulletin No. 3 of the Division of Entomology, which Bulletin is in itself a complete report and was recommended by me for publication and appeared at the end of the year.

During the year the fruitfly control work by clean culture methods, as instituted by the Board of Agriculture and Forestry in November, 1911, has been continued by the Bureau of Entomology of the U. S. Department of Agriculture, of Washington, D. C., under the superintendence of Dr. E. A. Back, in charge of Mediterranean fruitfly investigations. He has also had direct charge of the inspection of all banana shipments to the Pacific coast. Results of this work will no doubt be reported by Dr. Back to the Bureau of Entomology and in due time will appear.

Staff.

During the first half of the year the staff of the Division of Entomology consisted of the writer as superintendent and chief inspector; Mr. D. B. Kuhns, assistant inspector; Messrs. Edward Drew, Robert W. Kanakanui and Isaac Kahele, as assistants on the wharves. On June 3rd, 1913, Mr. J. C. Bridwell was appointed assistant superintendent of entomology. On account of the unexpected developments in breeding and distributing the introduced parasites of the fruitfly and owing to the difficulty of finding proper men for such work here, he was immediately de-

tailed to assist Mr. D. T. Fullaway, whose services were very kindly loaned to the Board by the Hawaii Experiment Station, in the multiplication and distribution of fruitfly and hornfly parasites. Mr. Fullaway was called away from the work during the month of October to take up some special investigation in the Philippine Islands and Mr. Bridwell then assumed charge of the breeding work of all the parasites to the end of the year. Brother Matthias Newell has continued as our regular inspector at the Port of Hilo, Hawaii, and the following gentlemen have served as honorary inspectors at the various ports on the islands. Mr. E. Madden, Mahukona, Hawaii; Mr. E. R. Bevins, Kahului, Maui; Mr. W. D. McBryde, Koloa, Kauai; Dr. W. D. Deas, Hana, Maui; Capt. C. F. Turne, Kaanapali, Maui, and Mr. G. C. Munro, Keomoku, Lanai.

Work Performed.

During 1913 we again note a slight increase in the arrival of horticultural products as well as in the number of vessels entering the Territory.

Including the port of Hilo, we inspected 565 vessels, of which we found 342 carrying vegetable matter, amounting to 13,586 lot shipments, consisting of 295,928 packages. Of this amount 288,679 were packages of fruit and vegetables, direct imports for home consumption, 1866 packages were seeds and 5385 packages were plants.

From these shipments, on account of infestations, 922 packages were destroyed by burning, 3850 packages were fumigated before delivery and 371 packages were returned to the shippers.

Rice and Bean Shipments.

All shipments of rice and beans from the Orient have been carefully inspected, not only for the rice weevil (*Calandra oryzae*), which species already exists on the Islands, but more especially for the rice moth (*Paralipsa modesta*), a very serious pest of stored rice and beans. Under a ruling of the Board of Agriculture and Forestry all rice shipments are fumigated at the port of Kobe, Japan, this being the port of debarkation for this product. I am pleased to report that of the enormous quantity of rice, 266,677 bags, which arrived in the Territory during the year, only 3100 bags of rice had to be fumigated at Honolulu.

During the year we were surprised to find a consignment of soya beans badly infested with the rice moth and I immediately notified all shippers to have all bean shipments destined for these Islands fumigated at the port of debarkation in Japan. In this matter I had the heartiest coöperation of the shippers and of the Japanese Merchants' Association. During the year 15,075 bags

of beans arrived in the Territory and of this number only 162 bags were found infested with the moth.

About the middle of November the Toyo Kisen Kaisha Steamship Company made Hilo a port of call for their South American run instead of Honolulu. This meant the arrival of all kinds of freight, including rice and beans, direct from Japanese ports to Hilo. The first steamer brought 6457 bags of rice and 110 bags of beans. As this was a new experience for the Hilo inspector I thought it best to oversee his work and accordingly dispatched Mr. D. B. Kuhns, my local inspector, to attend to this matter. The shipments proved to be free from both rice pests.

Equipment.

The equipment of the Division of Entomology has been added to since my last report. In 1912 I drew attention to the inadequate quarters that were at our disposal for fumigating large shipments of infested rice [see page 120 of the 1912 report], and recommended the erection of a large fumigating house for this purpose at that time. During the latter part of the year a very good fumigating house 20 x 30 feet, with 12 foot ceiling, has been built near Pier No. 7, that being the dock where all Oriental cargoes are unloaded. In building this structure the very best plans for economy as well as efficiency were used. Also, two vent doors, one at the ceiling line for light gases and one at the floor line for heavy gases, make our fumigation absolutely without danger to human life. We have had occasion to test this house and have had excellent results.

Through the kindness of the Board of Harbor Commissioners, I have had the privilege of changing my main dock office on Pier No. 7 from a small office under the staircase to the one which was formerly occupied by the harbormaster, near the main entrance to the dock. This is more commodious and has greatly assisted us in this important branch of our work.

As the port of Hilo is now in direct communication with the Orient and as there are no facilities for handling infested rice shipments should any arrive there, it becomes apparent that we shall have to provide a similar fumigating house at that port. I would, therefore, recommend that the Commissioners consider this important matter favorably and enable the building of the necessary structure.

The question is often asked why rice shipments are found infested, when all rice is fumigated at Kobe, Japan. In answer to this I will state that our observations in the past have demonstrated that these shipments can easily become infested in the hold of the vessel during the voyage from Japan here, because all rice shipments going to the mainland are not fumigated before leaving Kobe. Our shipments of rice are very often placed alongside or even on top of these shipments. For this reason the

weevils and larvae of the rice moth can readily crawl from one lot to another. So long as these conditions continue, the consignee at Honolulu or Hilo can hardly be held responsible for the infestation if there be any on arrival, especially when he has complied with the fumigation regulations in Japan. All bills of lading for shipments of rice coming to this Territory have government certificates of fumigation attached. I have recently taken up this matter with the Commissioner of Horticulture of the State of California looking to the possibility of that State requiring the fumigation of all rice shipments in Japan and he has promised to look into the matter.

Inter-Island Inspection.

The rule which was drawn up by the Board of Agriculture and Forestry for establishing Inter-Island inspection was passed at the time when the Mediterranean fruitfly made its appearance on the Island of Oahu and its intention was to keep the pest from spreading from that island to the other islands. Now that the pest has gained a foothold on all the islands we are more convinced than ever that other pests which might be accidentally introduced at Honolulu, the port of entry, should be closely watched. All plants, fruit, vegetables and soil, capable of carrying pests of any kind, have been closely examined during the year and whenever found infested have been refused shipment to the other islands. Especial stress has been put on soil attached to the roots of plants which were removed from the ground or recently potted. The constant finding of grubs and beetles and especially finding the larvae of nymphs of cicadas in soil from Oriental countries shows clearly the necessity of a very close inspection here. Should accidental introduction of such pests as just mentioned, or should any plant disease carried in soil, ever occur, we are in a position through the Inter-Island inspection to prevent their dissemination to the other Islands for some time at least.

During the year 716 steamers going from Honolulu to the various ports on the other islands were attended to and 13,658 packages were examined. These consisted of 4075 packages of plants, 9252 packages of vegetables and 330 packages of fruit. The bulk of the plants were nursery stock shipped by the Division of Forestry in the usual plant boxes, being young seedlings grown in sterilized soil. The bulk of the vegetables was taro for poi-making and it was thoroughly washed before shipment. The fruit was mostly imported fruit from the mainland. In all 326 packages were refused shipment on account of infestation or, in the case of plants, because questionable soil was attached. Owing to the rush of passengers at the gangway at time of sailing it has been our practice to inspect the staterooms and especially look through the steerage quarters before the gangway is lowered.

Everything has been done to make the Inter-Island inspection thorough and up to date as far as finances would permit.

Federal Horticultural Board.

On December 1, 1912, I received my appointment as collaborator of the Federal Horticultural Board, authorizing me to carry out the Federal horticultural quarantine and inspection laws, which became operative on October 1, 1912. After receiving my appointment I realized the necessity of having assistance in case of illness or absence from the port or the Territory and I requested the appointment of Mr. J. C. Bridwell and Mr. D. B. Kuhns as collaborators. They have both been appointed as such, which will materially strengthen our work.

Although since 1904 under the Territorial law all fruits, vegetables and plants have been regularly inspected upon arrival in the Territory, the additional powers we receive under Federal regulations have materially assisted us in regulating the unlisted small package, usually brought in by tourists or travelling friends of our citizens. Under the regulations of the Federal Horticultural Board it is compulsory for an importer or his agent to make formal application for a permit to import into the United States or territories any plants or parts of plants. All such shipments, therefore, which arrived here without a permit, and this included those brought by passengers, were refused entry by either being kept on board the vessel or destroyed after landing. These regulations assist materially in discouraging the promiscuous fetching in of plants by the travelling public. These plants, gathered at random and packed in all kinds of soil, moss or other material, are a great menace. It is usually this small package wherein lies the greatest danger and one of the main objects of the Federal Horticultural Board is to discourage this traffic.

It is very apparent from the appended list of pests which were taken from the various shipments coming into this Territory, that our occupation has kept us quite busy. There could be no better proof of what horticultural inspection means to our several industries. The keeping out of some of the most serious pests known in various parts of the world means that we may continue having profitable industries in our country and that whatever crops we may raise will not be injured and cause us great losses.

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

RECAPITULATION OF INSPECTION WORK.

Vessels inspected, Honolulu.....	466	...
Vessels found carrying vegetable matter, Honolulu . . . . .	...	282

Vessels inspected, Hilo.....	99	...
Vessels found carrying vegetable matter, Hilo	...	60
	<u>565</u>	<u>342</u>

Disposal of Shipments, Honolulu.

	Lots	Packages
Passed as free from pests.....	10,925	256,169
Burned	613	911
Returned	14	183
Fumigated	110	3,850
Total, Honolulu	<u>11,662</u>	<u>261,113</u>

Disposal of Shipments, Hilo.

Passed as free from pests.....	1,921	34,616
Burned	2	11
Returned	1	188
Fumigated	0	0
Total, Hilo	<u>1,924</u>	<u>34,815</u>
Grand total, Hilo and Honolulu.....	<u>13,586</u>	<u>295,928</u>

Fruits and vegetables inspected.....	288,679
Plants inspected	5,383
Seeds inspected	1,866
Total	<u>295,928</u>

Rice Shipments.

Passed as free from pests.....	263,277	
Fumigated on account of infestation.....	3,400	266,677
Beans passed as free from pests.....	14,913	
Fumigated on account of bean moth.....	162	15,075

Inter-Island Inspection.

Steamers attended	716
Packages of fruits, vegetables and plants passed.....	13,332
Packages of fruits, vegetables and plants refused shipment	326
Total packages inspected.....	<u>13,658</u>

Injurious Insects and Plant Diseases Intercepted Which Were Found on Shipments of Fruits, Vegetables and Plants Imported Into the Territory During the Year 1913.

Coloptera or Beetles—*Cincindlid* larvae in stems of Orchids, Manila; *Carabid* beetle in moss packing, California; also 1 species found on wharf from California; these are beneficial. *Hydrophilus* species in soil on Iris roots, Japan; *Elater* species in Banana roots, Manila; *Elateria* larvae in soil on plants, Japan; these are very injurious to many plants. *Cerambycid* larvae in stems of ornamental trees, Japan. *Sylphid beetle* found on wharf; probably from California in commercial fertilizer. *Anomala* larvae in soil around plants, also larvae of *Melolontha* species and *Scarabid* species, probably several species were taken 5 or 6 times. *Chrysomelid* species, a leaf-eating beetle, in packing around plants from Sydney, N. S. W. Fleabeetle on Orchids from Manila. *Aracoceris* species in seeds of *Ziziphus trinerois*, Manila. The following weevils: *Bruchus prosopis* in Algaroba seeds from Arizona; *Bruchuschinensis* in beans and peas from Manila and Japan; *Bruchus pisorum* in Beans and Peas taken from Spanish immigrants from Gibraltar; *Balaninus* species in Chestnuts from Japan and U. S. A.; *Calandra granaria* in corn from the mainland; *Calandra oryzae* in Rice from China and Japan; a *Calandra* species in seeds from Sydney, N. S. W.; *Cryptorhynchus* species in seeds of *Heritiera littoralis* from Manila; *Sphenophoras* species in Banana roots from Manila; *Cylas formicarius* in Sweet potatoes and Yams from the Orient; *Acythocopus aterrimus* in stems of Orchids, Manila; *Alphitobius picus* in Banana roots, Manila.

Lepidoptera—*Butterflies and Moths*—*Anguonois* grain moth, *Sitotroga cerealella* in Corn from the United States; *Isia isabella* larvae found crawling on potato bags from Seattle; *Sesiid* larvae feeding on the bark and roots of Gardenia from Japan; *Paralipsa modesta* in Rice and Beans from Japan; Larvae of moths on roots of plants from Japan; Codling moth in apples and pears from California; *Anarsia lineatella*, the Peachmoth, in peaches from California; Leafminers in Citrus leaves from Sydney, N. S. W.; *Lycanid* larvae and pupae on Orchids from Manila.

Hemiptera—*True Bugs*—*Cicada* pupae and larvae in soil on plants from Japan, also in soil and packing around Orchids from Manila; *Aradid* species injuring orchids from Manila; *Reduviid* species found crawling on the wharf, probably from California. The following *Aphis* species, *Macrosiphum sanboriuns* on Chrysanthemums from California; *Macrosiphum rosae* on rose plants, California, and two species of *Myzus persicae* on carnations and *Cinerarias* from California.

Coccidae or Scale Insects—*Aspidiotus rapax* on laurel and apples from California; *Aspidiotus cyanophylli* on Orchids, Eastern states; *Chionaspis* species on Hibiscus, Tutuila, Samoa; *Chrysomphalus biformis* on Orchids, Manila; *Coccus hemisphae-*

ricum on *Ardisia cremilata*, Japan; *Coccus hesperidum* on Citrus, New York greenhouse; *Diaspis boisduvali* on Orchids, New Jersey nursery; *Fiorinia florinae* on Orchids, Java, and on *Strelitzia regina* from California; *Fiorinia* species on Orchids, Manila; *Lepidosaphes cocculi* on *Dendrobium*, Manila; *Lepidosaphes beekii* on Oranges, Florida; *Hemichionaspis minor* on Coconuts, Washington island; *Hemichionaspis aspidistrae* on Orchids, Sydney, N. S. W.; *Parlatoria pergandei* on Orchids, Manila, and on Rose plants, Japan; *Pulvinaria cammelicola* on Camellia, Japan; *Pseudococcus citri*, Orchids, Manila; *Pseudococcus pandani* on Palms, Samoa; *Pseudococcus azaleae* on Azalea, Japan; *Pseudococcus longispinus* on Palms, Sydney, N. S. W.; *Saissetia nigra* on Hibiscus, Samoa; *Saissetia oleae* on Palms, Sydney, N. S. W.

Formicidae or *Ants*—*Lasius niger*, *Prenolepis obscura* in soil from Japan; *Monomorium pharaonis*, *Tetramorium guineense*, *Dolichoderus bituberculatus*; *Prenolepis* species, *Ponericid* species in soil and packing from Manila; *Tetramorium guineense* in the roots of Palms, Sydney, N. S. W.; *Prenolepis imparis* and a Myrmicid species in soil, U. S. A. A *Ponericid* and Myrmicid species in baggage of immigrants from Gibraltar and a Myrmicid species in moss from England.

Diptera or *Flies*—*Ptectus* species, *Tipula* species and *Phorid* species in soil from Japan, *Phorbia brassica* in turnips from California and *Drosophilid* species in fruit from California.

There were also found Spiders, Millipeds and Centipeds in soil from Manila and other Oriental ports. Four species of *Mollusks* from Australia, Java and the Philippines and the following fungi: *Cladosporium citri* on Citrus, Japan, *Fusicladium dendriticum* and *pirinum* on Apples and Pears from California; *Cladosporium fructigenum* on Apples from Japan; *Oospora scabies* on Potatoes from Pacific Coast; *Phragmidium subcorticatum* on Roses from United States.

DIVISION OF FORESTRY.

ANNUAL REPORT SUPERINTENDENT OF FORESTRY.

Honolulu, December 31, 1913.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I have the honor to submit as follows a brief report covering the work of the Division of Forestry for the year 1913.

GENERAL SUMMARY.

Continuing the established policy now pursued for over a decade, the work of the Division of Forestry in 1913 was primarily directed to preserving and protecting the native Hawaiian

forest on the important watersheds throughout the Territory and to establishing on waste and other non-agricultural areas stands of valuable trees.

Several forest reserve projects that had for some time been pending were brought to final action in 1913 by the setting apart of additional sections of forest land on Oahu and Hawaii. As regards technical reservation of the land, the forest reserve system in Hawaii is now pretty well completed. Some scattered areas now wait to be brought within the boundaries to round out certain reserves, but taken by and large the belt of forest that is needed on each island to protect its water supply has nearly all been proclaimed as forest reserves.

The formal declaration that a given tract is a forest reserve does not of course exempt it from trespass. Such action is but a necessary step toward its adequate protection and proper administration. But it is in just this way that the year 1913 marks real advance. The action of the Legislature of 1913, in creating a special fund for forest and hydrographic work from the revenues derived from water licenses and leases, has made available for the first time since the organization of the forest reserve system in Hawaii funds for forest fencing and the active prosecution of other forms of protective work. Since July 1 several fencing projects have been got under way and preparation made under others for the inauguration of active work on the ground in the near future.

Along with the forest-reserve work the Division of Forestry has continued its accustomed distribution of seedling trees, free and at cost, to individuals and corporations engaged in tree planting and as far as was practicable has carried forward the testing in the nursery and the propagation for subsequent distribution of plant introductions new to the Territory. Requests for advice on forest questions have increased in number and variety. In a quiet way a great deal of information is thus given out, which, in connection with the distribution of plant material, is of material assistance to local tree planters. It is a phase of the work that meets a growing demand.

Other activities of the Division of Forestry have followed the lines of former years. The forest fire organization has been kept up to date by the appointment of new fire wardens. During the year members of the staff responded to a number of calls to fight fires. Fortunately all the fires occurring in 1913 were stopped before serious damage had been done.

The following paragraphs outline briefly the points touched on in this summary.

Forest Reserves.

The list of the new forest reserves created in 1913 is as follows:

Name and Island	Total area acres	Area Gov't. land, acres	Date of proclamation
Nanākuli, Oahu	1,010	1,010	June 4, 1913
Makua-Kaan, Oahu	4,716	4,376	" "
Kuaokala, Oahu	434	434	" "
Kohala Mountain, Hawaii.....	29,627	14,204	Oct. 13, 1913
Upper Waiakea, Hawaii.....	51,800	51,800	" "
Upper Olaa, Hawaii.....	9,280	9,280	" "
Honolulu Watershed, Oahu.....	6,950	5,000	" "

On October 13, 1913, the boundary of the Moloaa forest reserve on Kauai was modified by the elimination of 83 acres and the addition of 34 acres, a net decrease of 49 acres. This action was taken on the basis of a recent survey, to straighten the boundary and exclude from the reserve a section of open land suitable for grazing and found not to be essential for water protection.

At the end of the year 1913 there were 34 forest reserves in Hawaii with a total area of 786,869 acres, of which 69 per cent. (540,877 acres) was land belonging to the Territory.

Forest Fencing.

The action of the Legislature, in setting apart the water revenues from Government forest lands as a special fund to be used for forest and hydrographic work, was one result of the long campaign that has been carried on by the Board for securing better provision for the protection of the native forests. In securing the final passage of the act, the efforts of a joint committee of the Hawaiian Sugar Planters' Association and the Board of Commissioners of Agriculture and Forestry played no small part. A comprehensive statement of the reasons why such a use of public moneys was justifiable, prepared by the chairman of that committee, Mr. W. M. Giffard, was printed early in the year. This statement also appeared as an appendix to the biennial report of the Board of Agriculture and Forestry, issued in March, 1913.

Under the terms of the new law (Act 57 of 1913) one-half of the revenues derived from the lease of water rights is devoted to forest work. The annual income for water rights is a little over \$66,000. The share for forestry is therefore \$33,000 per annum, an increase of about \$22,000 per annum over the amount which the Division of Forestry has had in recent years. Continuing the staff of the Division of Forestry unchanged and making the same provision as in the past for its routine work, the bulk of this money will be expended for the construction of forest fences on the boundaries of certain forest reserves where there remain gaps in the line, in the eradication of wild stock—cattle, goats and pigs—in other of the forests, and in planting areas of Government land with forest trees. During the six months period from June to December, 1913, fencing projects were got under way at Moloaa, Kauai, and at Makawao and Nahiku, Maui. At the end

of the year calls for tenders were out for other fences at Ninole, Kau, Hawaii, and at Luahalei, Oahu, both of which projects were actually started in January, 1914. Much preliminary work was also done toward getting ready to let contracts on several other fencing projects.

In the way of forest planting actual work has been going on since July, 1913, on the replanting of the slopes of Mount Sugar Loaf on Tantalus Heights, back of Honolulu, with a stand of two native Hawaiian trees, koa and kukui. The area chosen for the first work was on the bare hillsides at the head of a valley tributary to the reservoir in Makiki that is now in use by the City of Honolulu for domestic supply.

Another planting project, continued during the last six months of 1913 under this fund, was in the Koolau district, Maui, where the work of caring for young trees set out by the Alexander & Baldwin interests on Government land was kept on, as otherwise it could not have been. This particular project consists of tree planting in areas along the lines of the ditches of the East Maui irrigation system, where the native Hawaiian forest suddenly died off a few years ago. The present planting is being done under a planting plan worked out by the Division of Forestry.

Administration of Forest Land Under Government Leases.

During 1913 a number of visits of inspection were made to Government lands in various parts of the Territory to see that conditions in regard to forest protection, fencing and tree planting were being carried out. Following conferences with the Land Commissioner an improved system of coöperation between the two departments was worked out, that should in future result in a better enforcement of the Government's requirements. The immediate result of the inspection visits was, in several instances, an increase of activity on the part of the lessee in pushing forward work on fences and in tree planting. So far as possible it is the policy of the Territorial Government to secure the construction and maintenance of fences on forest reserve boundaries as conditions under the lease of adjoining agricultural or grazing lands. Provision was made in this way in 1913 for the upkeep of the fences a good part of the way around the Kohala mountain on Hawaii and in other districts for the carrying out of needed forest work.

In several places, too, tree planting has been required on tracts leased for grazing in specified areas. Notwithstanding unfavorable climatic conditions in 1912 and 1913, the results of the planting under these leases is generally encouraging. Especial mention may be made here of progress under such auspices in tree planting on the Parker and Kukaiau ranches, Hawaii, and on the Cornwell ranch on Maui.

Forest Extension.

Mention has already been made of the giving of advice on forest matters to anyone in the Territory who desires such help. This function of the Division of Forestry has grown in importance with the passing years. As much of it is verbal in response to inquiries made in person at the Nursery, it is not easy to keep an exact record of how much is accomplished, but from the number of persons calling on the Division it is evident that such assistance meets a real demand.

It may be noted in passing that during 1913 many requests came from Army officers recently arrived in Hawaii who desired to do their part in making the new posts more comfortable and attractive than they found them.

As in former years, the distribution of seedling trees, free and at cost price to individuals and to corporations, has gone steadily forward. Especial efforts have been made to render it easy for homesteaders to get trees, particularly in such localities as the recently opened tracts at Haiku, Maui, and Kapaa, Kauai. At other times as well as on Arbor Day, there have been periods of free distribution, and even when a charge is made the price is so low that no one who really wants trees need have reason to go without.

The two sub-nurseries so far established by the Board on Hawaii and on Kauai continue to serve their respective localities. That at Hilo, under the direction of Brother Matthias Newell, takes care of the Hilo district and, now that the Hilo railroad extension is in operation, a portion of Hamakua as well. From the Homestead nursery on Kauai, under the direction of Mr. Walter D. McBryde, trees are distributed to anyone who applies on the lee side of that island. And from Honolulu shipments are made to other parts of the Territory as there is demand. Accompanying this report is a tabular statement prepared by Mr. David Haugh, Forest Nurseryman, giving the statistics of the plant distribution for 1913.

Experimental Planting.

Only the briefest mention can be made here of a subordinate but highly important line of work carried on by the Division of Forestry, the trial and experimental planting of trees of economic importance new to Hawaii. From various sources seed is received from time to time and started in the propagating houses of the Government Nursery. The plants are then cared for in the experiment garden in Makiki valley and finally distributed or planted out where they can be kept track of. During the latter part of 1913 there were received from Mr. Joseph F. Rock, consulting botanist of the Board, a number of consignments of seeds that had been personally collected by him in India, during a trip around the world.

In connection with the sub-nursery at Homestead some experimental planting of exotics has been done at the Papahāhāhola Spring reserve. On Maui experimental forest planting in co-operation with the Division of Forestry is in progress at Kailili, under the charge of Mr. W. Hannestad, at Wailuku, under an agreement with the Wailuku Sugar Co., and in Koolau, under the arrangement with the East Maui Irrigation Company already referred to.

The experimental plantation of eucalypts in Nuuanu Valley, Oahu, started with funds provided by the U. S. Forest Service, has now got to the stage when the little trees can take care of themselves. It may be regarded as established.

Forest Fires.

During the year forest or brush fires were reported from the following localities: Kapaa, Kauai; Waipio, Wahiawa, Pacific Heights and Kalihi Valley, Oahu; Pukoo, Molokai, and Ninole, Kau, Hawaii. In each case the fire was got under control and put out before it had resulted in serious damage.

New fire wardens were appointed during 1913, as follows: Island of Kauai: F. A. Alexander (Koloa), G. P. Wilcox (Kawailau). Island of Oahu: H. Blomfield Brown, Geo. M. Robertson and Geo. Wilson (Waialua), C. J. Wheeler (Koolauloa) and Otto Ludloff (Koolaupoko). Island of Maui: Andrew Gross (Wailuku), A. K. Jones (Kahikinui). Island of Hawaii: Geo. Gibb (Kau), C. F. Eckart (Puna), D. S. Macalister and Alex. Morrison (Hamakua), and O. L. Sorenson (So. Kohala).

Publications.

The biennial Report of the Board and its several divisions for 1911 and 1912 was issued in March. As usual the divisional reports appeared also as separates, for distribution to persons and institutions interested only in particular phases of the work.

In June there appeared, as Botanical Bulletin No. 2 of the Board, a "List of Hawaiian Names of Plants," by Joseph F. Rock, consulting botanist of the Board. This list is compiled from Mr. Rock's volume, "The Indigenous Trees of the Hawaiian Islands," that appeared in June, 1913. Privately printed, under patronage, the field work on which this work was based was largely done while Mr. Rock was still actively on the staff of the Division of Forestry. The book is a highly valuable contribution to our knowledge of the Hawaiian flora and from now on will be looked to as the recognized authority in local dendrological questions.

Looking back at the year, nineteen thirteen may be regarded as the beginning of a new régime in the forest work of Hawaii—the time when education and propaganda gave place to getting actually under way in the forest on a scale large enough to be

worth while, the things that are necessary to a proper administration of its forests.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

DIVISION OF HYDROGRAPHY.

ANNUAL REPORT FOR THE YEAR 1913.

April 7, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—The following brief report of operations of the Division of Hydrography for the period July 1 to December 31, 1913, is submitted:

The Division of Hydrography was created by Act 56 of the 1913 Legislature on July 1, 1913, which provided that the present District of Hawaii of the U. S. Geological Survey, Water Resources Branch, should become a division of the Bureau of Agriculture and Forestry.

During the six months period a large amount of reconnaissance surveys have been made on all islands, preliminary to the outlining of a definite policy as to the carrying on of the work. All of these investigations were completed on December 31, and stream measurement stations have been selected on all streams and ditches to be investigated. The policy adopted in this connection is covered in detail in a special report under date of October 3, 1913. A further special report has been submitted on "Kauai Irrigation Projects" under date of November 6, 1913.

The field work of the Special Kona, Hawaii, Investigation authorized by Act 102 of the 1913 Legislature was practically completed. Stream and rainfall measurements will be continued during the calendar year 1914, after which the final report and estimate will be filed.

The following tabulation shows the status of all stream and rain gaging work during the period ending December 31, 1913. Attention is invited to the decrease in the number of stations. This is the result of the policy adopted to abandon all stations of which the records can not be of value in connection with present or future utilization and development. Since December 31 many of the discontinued stations have been replaced by permanent stations at locations where these records will be of value.

It is estimated that about three hundred stream and ditch measurement stations will be necessary to entirely cover the islands of Kauai, Oahu, Maui, Molokai and Hawaii.

Stream Measurement Stations.

Island	June 30, 1913	Established	Discontinued	Dec. 31, 1913	Measurements made at regular stations	Miscellaneous measurements made
Kauai	43	1	10	34	24	....
Oahu	27	....	6	21	70	42
Maui	48	6	15	39	77	17
Hawaii	87	....	87	....	1	6
Kona Investigation..	...	1	....	1	....	6
Total	205	8	118	95	172	71

In addition to the above records were furnished from private sources as follows: Kauai, 10; Oahu, 0; Maui, 17; Hawaii, 2; total, 29 stations.

Rainfall Measurement Stations.

Island	June 30, 1913	Established	Discontinued	Dec. 31, 1913
Kauai	28	....	....	28
Oahu	6	1	....	7
Maui	18	....	....	18
Hawaii	20	1	20	1
Kona Investigation .....	...	15	....	15
Total	72	17	20	69

In addition to the above records were furnished from private sources as follows: Kauai, 6; Oahu, 1; Maui, 16; Hawaii, 1; total, 34.

Evaporation Measurement Stations.

All of these were established between July 1 and December 31, 1913: Kauai, 4; Oahu, 3; Maui, 4; Hawaii, 0; Kona Investigation, 3; total, 14.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, April 30, 1914.

Albert Waterhouse, Esq., President and Executive Officer, Board of Agriculture and Forestry.

Sir:—I beg to report on the work of the Division of Animal Industry for the month of April, 1914, as follows:

Bovine Tuberculosis Control.

As will be seen from the appended report of Dr. Case another test of the dairy herds of Honolulu has nearly been finished; that is, practically all, with the exception of the railroad ranches, have now been through the fifth test. The final result of 2.89% of reactors looks at first sight as an increase in the number of animals affected, but when the several thousand head of railroad ranch cattle is added—among which it is not expected that any, or at least very few, reactors will be found—the final percentage will be materially reduced.

As an example of the efficiency of the test it may be mentioned that one of the largest dairy herds in the county, but at the same time the one in which the eradication of tuberculosis was first begun, this time came through the test with a single reactor. While this animal was sent to the slaughterhouse immediately it must not be taken for granted that the herd, consisting of several hundred head, is now permanently free from the disease. In this mild climate the infection seems able to persist for a considerable length of time unless destroyed by repeated and effective disinfection, and even when this precaution has been taken the disease has been known to crop up again after two or even three successful tests have been passed.

This statement should not be considered as discouraging but on the contrary should stimulate every milk producer who has once got his herd cleaned up not to drop the work there but to continue the same vigilance against its recurrence as was taken towards its eradication, and in a community where the inspection and testing is done without any cost to the owners this cannot be considered a hardship, when a herd has once been cleaned up it cannot suddenly drop back to be a heavily infected herd, unless gross carelessness or criminal negligence is practiced by the owner or his employees. The immense importance of the subject, that is, the recurrence of tuberculosis in a herd once declared clean, may be understood when it is learned that one of the principal papers to be discussed at the annual meeting of the American Association of Medical Milk Commissioners, to be held at Rochester, N. Y., June 10-20, 1914, is entitled, "The Amount of Return Tuberculosis in Certified Herds," by no less an authority

than Dr. W. H. Park, chief of the hygienic laboratories of the Board of Health of New York City, the same scientist who was quoted in one of my recent reports as author of the statement that not less than 300 children die annually in that city from tuberculosis of proved bovine origin, the infection in every case being traced to milk from tuberculosis cows.

While by far the greater majority of milk producers in Honolulu have got their herds cleaned up so far as tuberculosis is concerned, there has at the same time occurred a distinct relapse in the amount of care and cleanliness employed in a number of the local dairies. This applies to animals as well as to premises, and, so far as the milk is concerned, to utensils as well as to methods; in short the present form of milk inspection in the city and county of Honolulu cannot be considered anything but a farce. When to this is added an unfortunate tendency on the part of a few dairymen and cattle dealers to traffic in condemned tuberculous cows it will be seen that the ultimate complete eradication of bovine tuberculosis cannot be expected in the immediate future, unless more drastic measures be adopted.

There still remains, even in the heart of the city, private herds or individual family cows, that have never been tested and which the owners object to having tested. Such animals remain a menace to all the milk producers, not alone in the immediate vicinity, but, through trade and transfer, to every part of the city and county, who have earnestly endeavored to eradicate the disease from their herds, and they certainly are entitled to protection as much as the general public are entitled to clean milk. Filthy stables and unsanitary methods and milk rooms can only serve to keep the infection alive while diseased animals may spread it promiscuously in being transferred from place to place.

An animal which has reacted to the tuberculin test can under the statutes of Hawaii and the rules and regulations of the Board of Agriculture and Forestry, as well as those of the Board of Supervisors, neither be used for dairy purposes nor any other purposes, nor be sold or exposed, but can only be taken to the slaughterhouse or otherwise destroyed under competent supervision, and, if the carcass is passed as fit for human consumption, it can be sold as beef. Consequently anybody who purchases or sells a reacting animal and disposes of it in any other way is violating the law and must take the consequences.

The statistics of the Board of Health as well as of the Anti-Tuberculosis League have fully demonstrated that infantile tuberculosis has diminished to a considerable degree in the city of Honolulu since the eradication of bovine tuberculosis was practically accomplished—that is, in other words, a number of human lives is annually being saved as the direct result of the work of this board, which should be sufficient to put a stop to any interference with or obstruction of such work. And now that we are approaching the warmest season of the year, when milk deterio-

rates twice as fast as at any other time, there is every reason why the local milk regulations should be complied with and their enforcement placed in efficient hands.

The improved method of testing mentioned in last month's report whereby the injection is being made under the eye instead of under the tail continues to give highly satisfactory results, and will undoubtedly be adopted wherever it becomes known. Photographs showing the pronounced reaction resulting from this new method of injection are appended hereto and, while not every reaction is as pronounced as two of those shown, it may be said that the smaller one (the black animal) shows an average reaction, which in all cases is very plain.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, April 31, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to report as follows on the work of the month of April, 1914:

Tuberculosis Control.

	T.	P.	C.
J. M. Whitney.....	13	13	0
J. H. Cummings.....	7	7	0
H. Focke	7	3	4
F. K. Makino.....	2	2	0
M. Quintal	6	6	0
S. Tsumoto	8	8	0
Lunalilo Home	19	19	0
B. M. Allen.....	17	15	2
Dr. Straub	17	15	2
F. Valph	7	7	0
F. Correa	12	12	0
W. P. Louis.....	3	3	0
K. Oshiro	11	11	0
M. Kawamura	7	7	0
Geo. Wond	28	28	0
Kamehameha Schools	48	47	1
C. J. Day.....	4	4	0
D. Tello	2	2	0
J. P. Mendonca.....	9	9	0
Geo. Holt	27	18	9
S. M. Damon.....	320	317	3
Y. Nakamura	4	4	0
S. Boyama	5	5	0
I. Morioko	20	20	0

The above table gives a total of 603 head of cattle tested out of which number 582 were passed and tagged and 21 head condemned and branded. Up to the present time 2490 head of cattle have been tested with the result that 72 head or 2.89% have been found diseased and consequently condemned and branded. This is a decrease of 1% from the amount of disease present in the same district last year.

Importation of Live Stock.

S. S. Lurline, San Francisco: 15 horses, Hawaiian Pineapple Co.; 8 horses, A. W. Eames; 1 dog, Mrs. Belle Bucklin; 5 Berkshire hogs, Cornwell Ranch; 20 crates poultry.

S. S. Wilhelmina, San Francisco: 32 crates poultry; 1 dog, Mrs. L. Mathew.

S. S. Sonoma, Sydney: 1 dog, Mrs. E. Adams.

S. S. Missourian, Seattle: 169 butcher hogs, A. L. Macpherson.

S. S. Niagara, Sydney: 1 dog, Mr. Harvey.

S. S. Manoa, San Francisco: 22 mules, Schuman Carriage Co.; 21 cows (grades), 2 calves (grades), 1 bull (Holstein), 1 bull (shorthorn), 3 horses, 26 crates poultry, Charles Bellina; 8 crates poultry.

S. S. Matsonia, San Francisco: 2 crates poultry, 2 pigs, A. Zumstein; 10 crates poultry, G. S. Mackenzie; 5 crates poultry, Sing Sing.

Respectfully submitted,

LEONARD N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, April 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of April, 1914, as follows:

During the month 36 vessels arrived at the port of Honolulu, of which 26 carried vegetable matter and 2 carried moulding sand.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	648	17,712
Fumigated	33	7,771
Burned	62	91
Returned	8	21
Total inspected	751	25,595

Of these shipments 25,301 packages arrived as freight, 177 packages by mail and 117 packages as baggage of passengers and immigrants.

Rice and Bean Shipments.

During the month the usual quota of rice and bean shipments from the Orient was thoroughly inspected. Thirty-two thousand five hundred seventy-six bags of rice and 2357 bags of beans arrived which were found free from pests and allowed to land.

Pests Intercepted.

Forty-eight packages of fruit and 23 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited from entry, was seized and destroyed by burning.

Three packages of plants and 3 packages of seeds arrived by parcels post from a foreign country and, under the ruling of the Federal horticultural board, were returned to the shipper by the postmaster.

The Luka brought a cargo of coconuts (about 4000) and by previous arrangement they were turned over to us for treatment. They were fumigated in the large fumigating house on Kilauea street in the usual manner and more particularly as a precautionary measure. A few of the nuts had indications of the work of *Lepidopterous* larvae, feeding in the old, soft fibre. Probably it is the same species we have here.

A large package of Japanese sugarcane came by mail from Florida. I found it infested with the fungus *Colletotrichum falcatum*, kindly determined for me by Dr. Lyon, and ordered it burnt in Lucas' mill. The party receiving it lives on Maui and saw an advertisement in a paper that this kind of sugarcane is good for forage. Through the kindness of the H. S. P. A. she will receive a good supply of Japanese sugarcane in a few weeks.

Three hundred twenty-five cases of apples had to be overhauled on account of containing larvae of the codlingmoth between the ends and sides of the boxes, the fruit being in excellent condition and free from worms. I have notified the shippers of this condition and I have warned them that in the future such shipments will be either returned to them or destroyed. Fifteen boxes of apples were infested with codlingmoth and were returned to the Coast.

A case of hibiscus cuttings and one of growing ginger arrived by the S. S. Sonoma from Samoa and not having the necessary permit from the Federal horticultural board were ordered destroyed. The hibiscus cuttings were infested with two scale insects, *Saissetia nigra* and *Chionaspis mussacndae*; the ginger with a mealy bug.

Another case arriving from Singapore containing orchids was also ordered destroyed, not having the required permit from the Federal horticultural board.

A box containing some roseplants and geraniums arrived from the Coast; the geraniums were infested with the Greenhouse white fly, *Aleyrodes vaporariorum*, and were fumigated before delivery. The following insects were taken from a shipment of orchids from Manila: Two species of ants in the packing and around the roots of one plant. One plant infested with a scale insect, *Lepidosaphes cocculi*, the orchid borer (*Acythocopeus atterrimus*), 2 species of weevils in the larvae, some *capsids* and three species of beetles—a *Dytiscid*, a *Carabid* and a fleabeetle, crawling about in the packing. Shortly before the sailing of the S. S. Nippon Maru on April 9 one of the U. S. immigration officers found two caterpillars crawling on the coatsleeve of the interpreter. One of the ship's plants probably was infested with the pest and passing by he must have brushed against it and dislodged the caterpillars. It was too late to examine the ship's plants but the two caterpillars are in the cabinet of the division. This goes to show how easy it is for pests to be carried ashore without being contained in a shipment consigned to this port. Plants used as table decorations on board ship are often found infested with various pests.

The ship John Ena with coal and moulding sand was sent to Pearl Harbor direct. After notifying the authorities of the soil regulations they notified us when the sand could be examined. It proved to be the ordinary moulding sand and was allowed to land.

Beneficial Insects.

Several lots of Japanese beetle fungus were distributed during the month. Also a colony of ladybirds which Mr. Fullaway brought from Manila. He has liberated several colonies in various places. These are supposed to feed on mealybugs.

Four packages of dungfly parasites arrived from Dr. Silvestri. These were staphylinid beetles which feed on the larvae of all dungflies, the housefly, stablefly and possibly the hornfly. Upon arrival all live beetles are taken from the material and placed in manure containing housefly larvae. All material is thoroughly fumigated and then destroyed by burning, lest there be some eggs or a germ which might accidentally bring a new pest into the country. A thorough record is kept of every shipment, its condition on arrival and where distributed.

Hilo Inspection.

Brother Newell at Hilo reports the arrival of eleven steamers, six of which brought vegetable matter consisting of 132 lots and 2408 packages. All of these were found free from pests and were passed.

Inter-Island Inspection.

During the month of April 54 steamers plying between the islands were attended to and the following shipments were inspected:

Plants	59 packages
Taro	418 bags
Vegetables	19 packages
Fruit	18 packages

Total passed 514 packages

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to plants:

Plants	14 packages
Fruit	3 packages
Vegetables	1 package

Total refused 18 packages

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, April 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the routine report of the Division of Forestry for April, 1914:

FENCING OF FOREST RESERVE BOUNDARIES.

During the first week of April I made a quick trip to Hawaii to inspect the forest fence at Ninole, Kau, going over from Hilo with the contractor, Mr. C. H. Will. This fence follows the mauka line of the Ninole homesteads and is designed to close an unprotected gap in the forest boundary between the protected forests above the Hawaiian Agricultural Company lands and the Hutchinson plantation.

Towards the end of the month, under an agreement between Mr. J. Frank Woods and the Government to unite in the building of a fence along one course of the Kohala Mountain

forest reserve boundary, between the lands of Kawaihae 1 and Waika, in North Kohala, Hawaii, Mr. F. W. P. Bluett was instructed to run out and clear the line on the ground. This fence will protect the Kohala mountain on the west by filling in the gap between the Honokane gulch and the corner of the forest reserve fence that now runs across the face of this mountain. Work on the fence itself will be begun in the near future.

Progress is reported on the other fencing projects now under way under the auspices of the board above Lihue, Kauai; at Naliku, Maui, and at Lualualei, Oahu. Dr. J. H. Raymond reports that the fence around the Polipoli spring in the Kula forest reserve, Maui, is being repaired and that it should be completed within a month.

Finding that dairy cattle from Palolo were working up the ridge between Palolo and Manoa, a short stretch of temporary fence was put up across the top of the ridge by employees of this board on April 21. This will serve to prevent stock from getting mauka into the thick forest until such time as a proper fence can be built on the line between the lands of Wailupe and Pukele (government). Negotiations for this fence are now in hand. With this exception the Honolulu Watershed forest reserve is not anywhere in danger from cattle.

TREE PLANTING.

Homestead, Kauai.

A report recently received from Mr. Walter D. McBryde in regard to the plant distribution during 1913 from the Division of Forestry nursery at Homestead, Kauai, shows a total of 6500 trees given out for that calendar year. In addition 12,044 trees were planted in the Papapaholahola Spring reserve. This number includes several species of eucalypts, koa, silk oak and Japanese cedar, all of which "have made a most satisfactory growth, due in part to the fact that all land to be planted to trees is first given a good plowing and just prior to planting is well harrowed.

"A good road has been built to the Spring reserve by the county, making the same accessible to those desirous of getting trees from the nursery. The road within the reserve itself was built from moneys received from the department." The value of this sub-nursery is yearly becoming more apparent. It is a decidedly useful institution.

Kukaiau Ranch, Hawaii.

Under the terms of four Government leases, tree planting is required on certain of the Government lands that form a part of the Kukaiau ranch, Hamakua, Hawaii. During the last week of April I made a thorough inspection and count of the tree plots, finding the work well in hand as to the number planted, and the

young trees satisfactorily established. Three of the leases require that the tree planting shall be done during the first five years of the term; on the fourth, during the first eight years. With the exception of two plots which are to be completed during the next month, the required number of trees has been set out.

Notwithstanding delays, setbacks and losses caused by the dry weather during 1912 and 1913 the work is now up to date, the blanks in some of the earlier planted plots caused by the trees dying having recently been filled in. This tree planting was started by Mr. Robert Horner when he was manager of the ranch. For the past two years it has been carried on by his successor, Mr. Donald B. Macalister.

Kona, Hawaii.

On April 30, a lot of 2000 sugi seedlings (Japanese cedar) was shipped to Mr. L. Macfarlane, manager of the Captain Cook Coffee Co. of Kcalakekua, Kona, Hawaii, to use in extending a stand of this tree begun two years ago. Sugi (*Cryptomeria Japonica*) has proved itself to be well adapted for use at the higher levels in this Territory. This particular plantation should serve not only as a valuable asset to its owners, but also as a good object lesson to other land owners in Kona. Sugi is a valuable timber tree that deserves to be more generally planted in Hawaii.

ADVICE AND COOPERATION.

Pursuant to the established policy of the Division to give advice on forest matters, I visited the Bishop Estate land of Heeiea, Oahu, on April 13, at the request of Mr. G. H. Gere, agent of that estate, to consider on the ground questions of tree planting and forest fencing. Other cases in which the Division of Forestry has rendered aid to the public in this manner are listed in the report of the forest nurseryman, which as usual is submitted herewith.

FOREST FIRE.

On the afternoon of April 10, the staff and four laborers of the Division of Forestry reported to a call to fight fire above Lot No. 9 of the Palolo homestead tract. This fire originated in the escape of a small bonfire from the dooryard of the occupant of the lot, Manuel Souza. Getting into the dry grass it ran up to the ridge on the east side of Palolo valley, burning over some 10 to 15 acres of grass and brush, and killing some thickets of ti and a few koa trees. Through the efforts of Mr. Souza it had been got practically under control by the time we arrived, so that our work consisted in putting out the smouldering embers that might have again been fanned into flame by a rising wind.

For speedy transportation to this fire the Division of Forestry is again indebted to the Division of Hydrography, Mr. Larrison

having put his automobile at our disposal and taken our party to the nearest practicable point for attacking the fire.

Under the date of April 15, I renewed, as chief fire warden, the special warning that has now been in force for some years, forbidding the burning of brush on Tantalus heights and on the Kalawahine ridge unless a permit is first obtained. The new period runs until June 30, 1915.

ROUTINE WORK.

As usual considerable time was spent during the month in routine administrative work, including the preparation of several short special reports on various matters that have been submitted to the Board. The report of the forest nurseryman contains additional details regarding the plant distribution work.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, April 30, 1914.

R. S. Hosmer, Esq.,
Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of April, 1914:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold	351	31	382	
Gratis	1000	1050	898	2948
	1000	1401	929	3330

Collections.

Collections on account of plants sold amounted to \$8.20.

Plantation Companies and Other Corporations.

The distribution of trees under this heading amounted to 400 pot grown.

Experimental Garden, Makiki.

The work at this station consisted principally of the usual routine work, mixing and sterilizing soil, transplanting trees, etc.

Honolulu Watershed Planting.

The work on the face of Sugar Loaf is progressing. Four hundred seventy-four kukui trees and 175 koa trees were planted during the month. Other work done consisted of clearing off and making holes, also hocking the trees first planted.

Advice and Assistance.

The writer, at the request of a number of people, paid visits and answered inquiries as follows:

Calls made in and around city, 4; advice by telephone, 5; advice given at nursery, 4; letters of advice to other islands, 6.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

May 11, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the division of hydrography during the month of April, 1914, is submitted:

Oahu.

Stevens automatic continuous registers were installed on the new stations on the Haiku, Kahana, and Punaluu streams. Alterations were made to the concrete measuring weir on the Nuuanu stream, and a shelter was constructed to house the new Bristol water register which has been loaned by the College of Hawaii. Two new converted Watson continuous water register stations were established on the east and west branches of the Manoa stream.

Two coöperative staff gage stations were established on the Waiahole stream to show the developed water in the Waiahole tunnel. All costs incident to the establishment of these stations was borne by the Waiahole Water Co. The regular station on the Waiahole stream was also improved, and three stations in the Kailua valley were repaired. The regular station on the Poha-

kea stream was discontinued as sufficient data have been secured to rate this stream.

In addition to the above 19 measurements were made and six rain gages were read.

From April 29 to May 1 a reconnaissance was made of the streams in the vicinity of Ilauala, and tentative arrangements were made to establish from four to six cooperative stations for the Laie and Kahuku plantations. It has been proposed that, if the plantations will purchase and install the necessary equipment and materials, this division will furnish the supervising engineer and will rate the stations. Should this arrangement be consummated all windward Oahu streams will be under investigation, except the Waianu, Waikane, Kahaluu, Waihee, Kaalaea, Kaulanui, and Kaipapau streams.

An abundance of rain fell on Oahu during the month, and all surface and underground storage was well replenished.

Kauai.

Little was done on Kauai during the first part of the month as Mr. Hardy left Waimea April 1 and Mr. Dort, his successor, did not arrive until April 16. During this period Mr. Horner spent all of his time constructing the new trail to the new Lumahai station. This trail was completed on April 30. The latter part of the month was spent on general maintenance and construction work on windward Kauai.

Six rainfall stations were visited and the stations on the Anahola, Kapahi, and Kaneha ditches, the old station on the Lumahai stream, and the station on the Halekua stream were discontinued as having served the purpose for which these were established.

Maui.

Only routine work was done on Maui with the exception of the construction of foot bridges for flood measurements on the Hoolawanui and Hoolawaliilii streams. Twenty-one stream and five rainfall stations were visited, and twenty-two stream measurements were made.

An unusual amount of rain fell during the month, although there were no extreme floods. The lowlands were unusually well supplied. The Wailuku Sugar Co. did not find it necessary to irrigate from March 25 to April 27, a period of 33 days.

MAY PLANS.

Oahu.

A reconnaissance of the Laie and Kahuku streams will be completed and station sites selected.

Kauai

The Lumahai clock register station will be completed and work started on either the Wainiha or Waioli station the latter including the construction of about three miles of trail

Mau

Routine field measurement and rating work will be done

Very respectfully

G K LARRISON,
Superintendent of Hydrography

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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

JUNE, 1914.

No. 6

CIRCULAR GIVES FOREST FACTS.

Striking facts regarding our forest resources, their value and their waste, are condensed in an eight-page illustrated circular of the American forestry association just issued. The lumber industry is said to employ 735,000 people, to whom are paid annually \$367,000,000 in wages, the worth of products being \$1,250,000,000. The forests of the country cover 550,000,000 acres.

An average of 70 human lives are sacrificed annually in forest fires, says the circular, and a loss occurs of \$25,000,000. Damage from insects and tree diseases, which follow fire, costs each year \$50,000,000. The cost of destruction resulting from floods is not estimated, but is given as "countless millions."

But the circular expresses hope more than pessimism. As well as the colored pictures showing the forest fire, the effects of the fire, and the damage caused by floods, it shows also forests planted and grown under intensive management, and the national forest ranger scouting for fires on the mountain lookout station. The effective patrol here referred to has reduced "forest fire losses to as low as one-tenth of one cent an acre." It is pointed out that by planting forests an annual income could be derived in the country of \$65,000,000; and by preservative treatment upon timber each year \$100,000,000 could be saved.

TOBACCO CULTURE.

A bulletin is quoted by the *Tropical Agriculturist* (Ceylon) as saying that the best quality of tobacco leaves are produced when the plant grows very rapidly; consequently an abundant and readily available water supply at the right moment is an important factor in the production of high class tobacco. Dry weather in the early stages of plant growth would cause a considerable development of the root system in search of moisture; should this be followed by rains—about a month after planting out—optimum conditions should then obtain for rapid growth.

In the same magazine appears an article on the enzymes of the tobacco plant, which opens with the statement: "Many chemical changes take place in the tobacco plant throughout its growth

as well as during the curing and fermentation periods. New chemical substances are formed and others are decomposed. The final result of these reactions gives the color, texture and aroma to the finished product. A change in these transformations is sufficient to destroy the value of the crop." For the rest, the article goes on to show, partly on the authority of Loew, that the curing process is not due to bacterial agencies, for, "if this were so, it would be possible to produce any desired brand of tobacco simply by inoculation," but that the changes "are due to soluble ferments or enzymes, which are produced in the plant during its development;" Loew having shown the presence of diastase, oxidases, peroxidases, proteolytic enzymes and cellulose-dissolving enzymes. In elaboration of this theory the article says that the enzymes are in the nature of proteins, and are present in the protoplasm of the cells. They are easily destroyed by excessive heat or too rapid drying. In studies of these enzymes in two Kentucky tobaccos, "the seed and leaves showed in every case the presence of appreciable quantities of invertase, diastase, emulsin and reductase, in many cases inulase and a proteolytic enzyme were also found. Soil, on the other hand, contained no enzymes except in two cases. Oxidases appear to be present in the tobacco leaf at all stages of its growth and gradually increase in amount from the seedling stage until the topping stage, after which they gradually decrease until, in the cured leaf, they practically disappear.

"During the curing and fermentation periods there is a great loss in weight, as much as 15 per cent., about $\frac{1}{4}$ of which is solid matter. Certain gases are developed, amongst which ammonia is easily detected. Practically all the starch disappears during the early part of the process and sugar is formed as a new product. This shows the important part played by diastase. The sugars also disappear, being probably destroyed by oxidases. The presence of invertase leads to the conclusion that cane sugar may be stored in the root and afterwards translocated to the leaves. The protein content of the leaves decreases considerably during the ripening of the plant, also during the curing and fermentation period. The presence of amino-compounds during these processes is further proof of proteolytic enzymes. The nitrates also decrease and the nicotine content diminishes. This suggests the presence of reductase and probably there are enzymes acting on the resins and gums. It is believed that the aroma of tobacco is partly due to the decomposition products of gums and resins, as well as to the breaking up of glucosides. Positive tests have been obtained for a glucoside splitting ferment. The presence of fats and proteins results in tobacco of inferior flavor. They are removed by lipolytic and proteolytic enzymes, provided the conditions are favorable.

"The characteristic brown color which develops during fermentation is attributed to the action of oxidases. During the

smoking process it has been shown that an ethereal oil is formed from certain products and this probably contributes to the flavor. Citric, malic and oxalic acids are found in greater quantities in the cured leaf than in the green leaf. These are probably transformed to acetic and butyric acids during fermentation. Thus we see that numerous complex chemical changes take place during the growth, curing and fermentation of tobacco and that enzymes play a very important part in these changes. For the product to obtain the greatest commercial value, extreme care and attention is necessary at the critical stage of maturity and also during the curing and fermentation."

Another plant for paper-making material is presented in this number, the *Hedychium coronarium*, the article describing which is from the *Tropical Agriculturist* of Ceylon. That journal suggests the plant as a possible new product for Ceylon, and it might be well worth experimenting with in Hawaii.

ALFALFA—A PROMISING FORAGE CROP FOR HAWAII.

(Continued.)

EXPERIMENTAL DATA FROM THE COLLEGE OF HAWAII FARM.

Purcelain is very easily destroyed, but its very rapid growth and continuous reappearance, especially during rainy seasons, makes it a serious pest in young alfalfa.

Worst of all worthless grasses, and the most difficult to eradicate, is the so-called "knot grass." It is rather deep rooted and has numerous underground stems with a number of knots or swellings from which the popular name is derived. These roots are removed from the soil with difficulty, and as each knot is capable of producing many more in a short time, especially when there is an abundance of moisture, it is obvious that the only way to combat it successfully is to keep at it persistently.

Insect Pests. A large number of insects, including several orders and species, are found to be injurious to the growing alfalfa crop, the most serious of which are the cut worms, army worms, alfalfa weevil, alfalfa looper, and various species of grasshoppers.

According to O. E. Essig¹ of California, the alfalfa weevil (*Phytonomus posticus*) has proven to be such a serious pest of

¹ Cal. State Comm. Hort. Monthly Bul. 1 and 2, 1913.



Comparative Study of Alfalfa Seedlings, 100 days from seeding.

alfalfa in Utah, Wyoming and Idaho that neither hay nor seed can be sent into California from these States without first being examined and fumigated by a State official. This weevil feeds on the leaves, and since spraying is dangerous to the animals, no efficient remedy has yet been discovered.

Among the alfalfa insects mentioned by O. E. Essig of California are the following:

Alfalfa weevil (*Phytonomus posticus*),
 Western army worm (*Chorizagrotis agrestis grote*),
 Alfalfa looper (*Autographa gamma californica*),
 Alfalfa crane fly (*Tipula simplex* Dyar),
 Grasshopper—various species,
 Western 12 spotted cucumber beetle (*Diabrotica sonor* Lee),
 (lover) or almond mite—(*Bryobia pratensis* gar)

According to Farmer's Bulletin No 495, the clover seed Chalcid fly (*Bruchpachus funebris* Howard) is also very injurious to alfalfa seed

Although the cut worm was the only serious pest at the College of Hawaii, it was found to be an extremely serious and difficult one to combat, owing to its presence in large numbers and to its habits. This worm feeds at night, devouring leaves, stalk and all, and hides in burrows a few inches under the ground during the day. This pest, together with weeds, was found to be the cause of a great deal of trouble and disappointment in our efforts to get a stand of alfalfa, for in one night what little growth that was made during a few days would be entirely wiped out.

All possible efforts were made to establish the crop; poisoned bait consisting of 5 lbs of bran, 5 lbs. middlings, 1 lb white arsenic, 1 lb sugar, and about 1 qt of water, laid out at the rate of 36 lbs per acre, was found to be fairly effective for several days. Flooding the field was also effective, but in spite of all our efforts, the cut worms continued their work of destruction and promised to maintain the supremacy. In ten feet of row one of the men counted 193 dead cut worms which had been poisoned the night before. The outlook was so disappointing that the men in charge of the field were on the point of giving it up, when it was decided to make a few more trials, which fortunately resulted in perfect success. Since the first crop was harvested there has been no more trouble with either weeds or cut worms, and the crops now being harvested are proving that the time, trouble, and expense devoted to the establishment of the field has been more than worth the effort.

Animal Pests. There are no animal pests of alfalfa in Hawaii, but various sections of the United States have found the woodchuck, ground squirrel, prairie dog, gopher and field mouse rather noxious at various times owing to their habits of burrowing into the ground and eating the roots. Being easily destroyed by drowning, they are not serious pests.

Fungous Diseases. Various fungous diseases have been reported from different regions as being rather serious in alfalfa fields, many of them being especially serious on certain varieties. They generally cause a wilting of the plant with a subsequent dying and rotting. Various fungicides have been used against such diseases with more or less success, but the only recommended method to combat them when they have once become well estab-

lished is to destroy the entire crop by burning and planting the infested and neighboring fields to other crops not subject to the diseases till they have been completely wiped out.

The most common fungous diseases are the various leaf spots, root rots, wilts, and damping off. While some of these are known to exist in Hawaii, and our alfalfa fields show signs of the presence of the leaf spots, they are of no economic importance with the common alfalfa.

Mr. Andrade found that his plantings of Arabian alfalfa at Moiliili, Oahu, were rather seriously infested by a form of root and crown rot.

This same disease is also present at the College of Hawaii farm, where the Arabian, Chilean, Kansas and Australian varieties are doing very well. Only a few plants of the last three varieties are affected, but the Arabian seems to be very much more susceptible to the disease. Very recently the Arabian plants were nearly all wilted by the disease, while those of other varieties close at hand were almost entirely unaffected.

Other Pests and Diseases. Alfalfa on the mainland is also subject to various other minor pests and diseases, including a nematode which causes root rot and a bacterial disease caused by *Pseudomonas medicaginis*. They are not considered to be at all serious.

COMPOSITION AND FEEDING VALUE OF THE CROP.

Alfalfa is a valuable crop for feeding because of its large yield of palatable forage and high per cent. of protein. Following is the average composition of digestible nutrients of alfalfa as compared with that of corn:

Alfalfa.

	Protein	(+ Fat \times 2.25) Carbohydrates	Fat	Nutritive Ratio
Green	3.7 %	8.65%	0.6%	1: 2.3
Water free	14.17	54.72	2.3	1: 2.4
Hay	12.3	40.7	1.6	1: 3.3
Meal	17.2	40.0	1.6	1: 3.3

Corn.

Green	1.0	12.5	0.4	1: 2.5
Grain	7.8	66.5	4.3	1: 8.5
Meal	6.4	66.3	3.4	1:10.4

Alfalfa is an excellent food for horses, cattle, sheep, brood cows, and laying hens, especially for milch cows and fattening animals. As it is not a proper ration when fed alone, it should be supple-

mented by other food, such as maize grain, barley, and wheat bran or middlings. The College of Hawaii has obtained very successful results with manienic pasture and the following daily ration:

Wheat bran, 5 lbs.; rolled barley, 3 lbs.

Alfalfa meal, 4 lbs.; green alfalfa, 20 lbs.

Alfalfa does not make good pasture, as it cannot stand heavy trampling and constant close cropping. There is little danger of bloat if the animals are turned on to the field when it is moist with dew, and, besides, the crop is too valuable to be wasted by pasturing.

A very good mixture for the silo or for roughage is one part of alfalfa to two parts of green field-corn or sorghum. This mixture does not only pack better in the silo, but it is also very well liked by the animals, milch cows especially.

ECONOMIC VALUE AS AN AGRICULTURAL CROP.

Alfalfa is the queen of nitrogen-gathering legumes. The plants not only work for nothing for themselves, but will also pay for the privilege.

It is a crop that needs very little attention when once established, which under favorable conditions may be after the first few months, and it lasts a long time. Its requirements are few, and it not only fits very readily into rotation with corn, sorghum and other non-leguminous crops, but also furnishes a large amount of that most costly food material protein. It not only restores the fertility of the land through its nitrogen gathering organisms, but always leaves it in good physical condition and with few weeds. Once established, the field becomes a constant source of food to be had for the cutting and, in dry weather, a little irrigation and tillage, and it excels all other forage crops from the standpoint of yield, feeding value, and cost of production.

Cost of production is the item of greatest importance, regardless of the thing produced. This was one of the main features of the experiment with alfalfa at the College of Hawaii, for no complete Hawaiian reports on this particular phase have as yet come under the writer's notice. The alfalfa growers in and about Honolulu have not taken the trouble to obtain accurate figures regarding either yields per acre or cost of production.

Bulletin 22 of the Nevada Station gives the following as the cost of growing one acre of alfalfa hay in 1909:

Interest and taxes or rent.....	\$ 5.196
Labor of cutting and stacking.....	4.878
Interest and depreciation on machinery.....	.256

Total cost per acre.....\$10.33

Average yield, 3.3 tons. Cost per ton, \$3.10.

Farmers' Bulletin 339 gives the following cost of production for the Eastern States:

Plowing	\$ 2.00
Harrowing	1.00
Fertilizers	10.00
Lime	5.00
Rent	3.50
Seed, 25 lbs. at 18c.....	4.50
Seeding .....	.50
Harvesting 3 tons at \$2.....	6.00
Plowing under alfalfa.....	3.00
Total cost	<u>\$35.50</u>
Three tons alfalfa at \$15.....	\$45.00
Cost to be deducted.....	<u>35.50</u>
Profit	<u>\$ 9.50</u>

The experiments at the College of Hawaii were begun last August, and the yearly cost and yields cannot be accurately calculated at present, but \$175 may be considered as a fairly good estimate of the annual cost per acre. This is rather high because of the necessary accuracy of weighing, etc., during the experiments, and the small plots which do not permit of the use of machinery to any extent. While the cost to establish the crop is high, the crop is lasting and subsequent harvests and cultivation cost but very little. At our last harvest, the total cost of cutting, weighing and cultivating a single crop was \$19.92 per acre, or \$2.25 per ton of green fodder obtained, not a bad investment with the market price of the product at \$5 per ton.

1. *Varieties Under Test.* Utah, Kansas and Australian strains of the common alfalfa and the Arabian variety were seeded August 20-22, 1912, in $\frac{1}{8}$ -acre plots at the rate of 15 lbs. per acre. The seed was drilled in rows 12 inches apart and 200 feet long. A light rainfall during the night of August 21 left the soil in good condition, with the result of good strong germination in all four plots.

2. *Troubles Begin.* Germination of the alfalfa seed was accompanied by that of a greater number of weeds, which kept what little labor there was to be had constantly busy at weeding. Before the plants had become more than a few inches high, the attack of cut worms described above made things still more discouraging, not only by their destructiveness, but also by their persistence.

3. *Combating the Worms.* Our troubles with weeds were considered rather serious, but the presence of the cut worms made them even greater. The laying of bait as described above under "Insect Pests" was at first found to be rather disappointing in its results; in fact, the outlook for success was so far from favorable that failure was already contemplated. However, the strong "never-say-die" spirit of Prof. Krauss, our agronomist, though beginning to totter, could not quite be shaken down. He faced the enemy with grim determination and finally won out after a long, hard fight.

The effectiveness of the bait lasted for several days in spite of light nightly rains. The Paris green mixture was a little better than the white arsenic, but from the standpoint of cost the latter was found to be preferable to the former.

As already mentioned, irrigation was found to be very helpful in drowning out the worms, and it seems that the most effective method of fighting these worms would be to till the soil lightly to loosen it up, irrigate thoroughly and heavily for a few hours and then lay out poisoned bait for those which escaped drowning. Since cut worms are active only at night, it is best to spread the bait as late in the afternoon as possible.

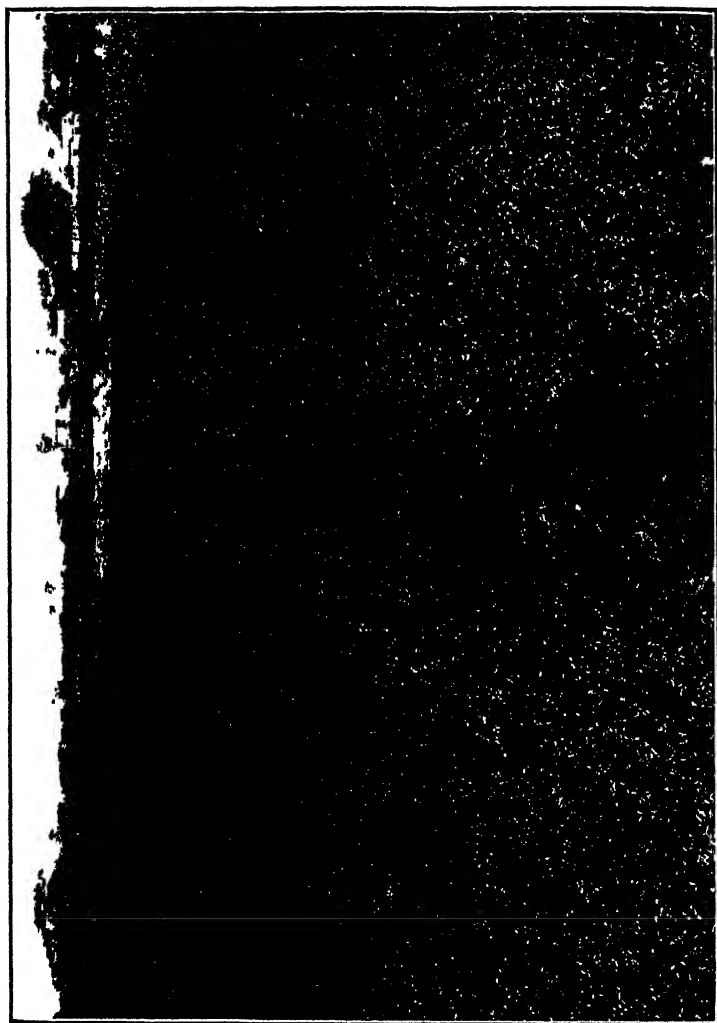
4. *Replanting.* The work of the cut worms was so destructive that it was found necessary to replant large portions here and there in order to obtain a good uniform stand. All plots were badly infested with cut worms, but it seems that the Arabian variety was the most susceptible.

5. *Growth of the Plants.* After the cut worms were held in check the plants grew very well. The first crop was harvested in the middle of October—seven weeks after planting. The plants were not quite mature and very small yields were, of course, obtained, but the prevalence of weeds and cut worms made it necessary to harvest early.

All four varieties have grown very well, but the Arabian variety has not blossomed and seeded well. The other three varieties proved very vigorous and produced an abundance of fodder and also a good deal of seed.

One plant of the Utah strain untouched by the sickle produced in seven months 308 vigorous stems by actual count and yielded large quantities of seed, which proved to be of good vitality. The College plans to do some breeding work with the progeny of this plant, which weighed more than five pounds on harvesting at the end of eight months. The stems were a little over four feet high, the average height of the whole Utah bed at maturity being three and one-half feet. The Arabian variety averaged but thirty inches.

That the cut worms are not troublesome after the plants have become well established is shown by another experiment conducted from January 11, 1913, to the middle of February. At



Young Alfalfa at College Farm, 1913.

this time two beds of the Utah and Kansas seed were planted broadcast in plots opposite those still under consideration, and separated only by a ten-foot roadway.

Germination was excellent, but the prevalence of weeds and cut worms, together with a shortage of labor, resulted in failure. The important point to be noted, however, is that while the cut worms were very destructive on the young seedlings, they did not harm the older plants.

6. *Irrigation and Fertilization.* All four plots received three irrigations of two hours each in September (September 1, 15 and

26) during the fight against the cut worms. On October 17 the Utah variety received an hour's irrigation in order to drown out cut worms. No further irrigation was made until March 3-6, when each plot was given a final irrigation of from two to three hours' duration.

At this time the Kansas and Arabian varieties were fertilized with nitrate of soda at 750 and 800 pounds per acre respectively. Since all four plots showed equal improvement, it was concluded that while the irrigation was beneficial, the addition of nitrate had little or no effect on the resulting crops.

7. *Harvesting.* Once established, the crops were ready for harvesting every thirty days for the common variety, and every third week for the Arabian.

All harvesting has been made with the ordinary hand grass sickle. This method should not be used on large fields, for the machine mower will do the work much more cheaply and rapidly. Therefore, in considering the figures on the "cost of harvesting" to follow later, the reader should not forget that the small size of the experimental plots and the hand cutting have made this item higher than it need be.

8. *Yields.* From the first to the last cutting the yields have been constantly increasing. While they were rather light at first, the last cuttings made so far were as follows:

Utah; May 19, 1913—2310 lbs. green or 9.2 tons per acre green.

Kansas; May 22, 1913—2076 lbs. green or 8.2 tons per acre green.

Australian; April 28-May 14—2096 lbs. green or 8.4 tons per acre green.

Arabian; April 28-May 14—1036 lbs. green or 4.2 tons per acre green.

Average, 7.5 tons per acre green.

These yields might have been even better if the crops had been taken at the proper time. The small herd of the College could not use more than about one-sixty-fourth of an acre of fodder per day, and the crops were therefore left standing till ready for use. Hence every bed was not cut absolutely uniformly, though an effort was made to harvest the crops as uniformly as possible.

(To be continued.)

SALT AS A MANURE.

In Söderbaums' experiments at Stockholm it was found that the application of common salt to oats caused a considerable increase in the yield of those cases in which nitrogen was given as nitrate of soda or sulphate of ammonia, but not in the form of ammonia

chloride. No injury due to manuring with common salt was observed. The results seem to justify the conclusion that where potash and phosphoric acid are present in sufficient quantity, and the water requirements of the plant are met, the increase yield by the addition of salt is to be traced to direct manurial effect, especially in respect of the chlorine part of it.—*Internat. Inst. of Agric.*

STORING AND MARKETING SWEET POTATOES.

(From Farmers' Bulletin 548, U. S. Department of Agriculture.)

Each year the sweet potato is becoming of greater importance as a money crop in the South. The value of this crop in the United States in 1909 was \$34,429,000, 90 per cent. of which was produced in the Southern States. The total area devoted to sweet potatoes in the United States increased from 537,000 acres in 1899 to 641,000 in 1909, and the yield increased from 42,500,000 to 52,200,000 bushels. The total value of the crop increased at a much more rapid rate than either the acreage or yield, showing an increase of 78.3 per cent. in 10 years.

With better methods of storing and marketing the potatoes, their value could be doubled without increasing the acreage or production. This is especially true in the South, where the potatoes are either rushed on the market at digging time, when the price is low, or stored in outdoor pits or banks, where a large portion decay. Very few of the sweet potatoes stored in pits or banks ever reach the market, for from 25 to 50 per cent. spoil and those that remain are not of good quality. Even if the pit or bank method of storage would keep the potatoes it is not economical. Too much labor and expense are required to make these banks every year and to get the potatoes out when wanted for market. Sweet potatoes can be marketed more economically and to much better advantage from storage houses. It is not advisable to open a bank when the soil is wet or the weather cold, as these conditions injure the potatoes and cause them to decay. Outdoor pits and banks can not be depended on. Some years a very small number of the potatoes spoil in banks, while in other years practically the whole crop is lost. The only safe and practicable method of storing sweet potatoes is in a storage house, as the potatoes can be taken out at any time without subjecting them to unfavorable conditions.

To keep sweet potatoes in good condition they must be (1) well matured before digging, (2) carefully handled, (3) well dried or cured after being put in the house, and (4) kept at a uniform temperature after they are cured.

The grower can judge when his sweet potatoes are ripe by breaking or cutting the tubers and leaving them exposed to the

air for a few minutes. If the cut or broken surface dries they are mature, but if the surface remains moist they are not ready to be dug.

The second essential, careful handling, is of the greatest importance and should be practiced in digging, gathering, hauling, and unloading. The potatoes should be sorted in the field and gathered in padded baskets or boxes to prevent bruising or breaking the skin. The baskets or boxes should be loaded on the wagon, hauled to the storage house, and the potatoes carefully poured into the bins. When they are to be hauled very far a wagon with bolster springs should be used. Sweet potatoes should never be thrown from one row to another, loaded loosely into a wagon body, or hauled in bags, because any of these methods will bruise them and give a chance for disease to enter.

Careful handling is one of the essentials in keeping sweet potatoes, and there is no more important place to practice it than in the field at digging time. The implement used to dig sweet potatoes should be one that does not cut or bruise the roots. One of the best types of diggers is a plow with rolling colters on the beam to cut the vines and with rods attached to the mold-board to free the roots from the soil and vines. After the potatoes are dug they should be scratched out by hand and allowed to remain exposed long enough to dry off. The digging should be done, if possible, when the weather is bright and the soil is dry.

The potatoes should be graded in the field in order to reduce the cost of handling to a minimum. A good plan is to go over the rows and pick up the sound, marketable potatoes in one basket, then gather all of the seed stock in another basket or box, and the injured ones in still another. These lots should be stored in different bins. By following this method it will not be necessary to grade the potatoes at the storage house and will thus save time and reduce the cost of handling. The potatoes should be poured into the bins as carefully as possible, to prevent bruising. Sweet potatoes can be stored in boxes, hampers, baskets, or bins with equally satisfactory results. The preference of the individual grower will determine the method to be employed. Each year after the sweet potatoes have been marketed the house should be thoroughly cleaned and disinfected before being used again. All dirt and refuse should be cleaned out and all parts of the interior sprayed or washed thoroughly with a solution of formalin (1 pint of formalin to 10 or 15 gallons of water). Diseased roots should not be thrown on the manure pile or on land to be used for sweet potatoes, the safest plan being to burn them.

In filling the storage house the workmen should begin at the back end of the bins and pour a layer of potatoes about 2 feet deep in all of the bins rather than fill one bin at a time. If the bins are 8 or 10 feet long it is a good plan to divide them into

two parts. By nailing cleats to the middle support of the bins, the partition can be raised as the bins are filled. The partition boards should have some space between them to allow free circulation of air. A 1-inch block between the boards will be satisfactory to separate them. By dividing the bins in this way the back of the bin can be filled without walking over the potatoes in the front part. When taking the potatoes out, those in one section of a bin can be removed without disturbing the remainder. This is very important where the potatoes are sold in small quantities.

One reason why southern farmers have not received good prices for their sweet potatoes is that they have not used proper methods of handling and marketing. In many cases the potatoes are badly bruised and cut in digging, are put in bags or rough barrels without grading, and are rushed on the market when there is an oversupply. The secrets of success in getting high prices are (1) to carefully grade, clean, and pack the product and (2) to put it upon the market when there is a good demand.

When the potatoes are to be marketed they must be carefully graded, no matter how well it had been done when they were put in the house. The market demands a medium-sized, uniform type of sweet potato, free from bruises or decayed spots. In grading, the large, overgrown, and the crooked, broken, or bruised roots should be kept at home for feeding or for canning. The best potatoes will bring a higher price when separated from the culls. Two market grades are sometimes made—the “extra selects” or “primes” and the “seconds” or “pic stock”—but the southern farmer will do well to make just one market grade and keep the others for feeding to his live stock.

After carefully grading the potatoes they should be put in clean, neat, attractive packages. Bags should never be used, as the potatoes become badly bruised when handled in this way. The standard veneer potato barrel with a burlap cover is usually used in summer or autumn, but for winter shipment the double-headed stave barrel or tight box is used. The smaller type of package, such as the bushel hamper, bushel box, or basket, is becoming more popular each year. A neat and attractive package of well-graded potatoes will bring a good price almost any time, even when the market is overstocked with inferior goods.

The value of the sweet potato has increased about 80 per cent. in the last 10 years. With better methods of storing and marketing the present value could be doubled.

Sweet potatoes can be kept satisfactorily in a storage house where the temperature and moisture conditions can be controlled.

Sweet potatoes to keep well must be well matured, carefully handled, thoroughly cured, and kept at a uniform temperature while in storage.

Thorough ventilation is essential during the curing period.

The temperature should be kept at about 80° or 85° F. during the curing period and reduced gradually to 55° after the potatoes are cured.

Fluctuations of temperature should be avoided throughout the storage period.

The varieties of sweet potatoes that the markets demand should be grown.

The potatoes should be carefully graded, cleaned, and packed in neat and attractive packages.

Sweet potatoes should never be marketed in bags or in bulk.

Veneer barrels or bushel hampers are desirable packages to use during mild weather and double-headed stave barrels or tight boxes in cold weather.

HEDYCHUM.

(From the *Tropical Agriculturist*.)

Peradeniya, May 15, 1913.

At the tenth ordinary meeting of the Royal Society of Arts held in London on February 12th last a paper on "New Sources of Supply for the Manufacture of Paper," by Messrs. Clayton Beadle and Henry P. Stevens, was read. Wood pulp is the raw material from which paper is chiefly made but it is now being realized that the world's supply of wood pulp is showing signs of exhaustion and that prices are rising. It is stated that the cost of production of ground wood pulp has advanced 50 per cent. in the United States during the last 10 years.

The paper trade has been turning its attention to other sources of supply of raw material and one of the plants to which attention is drawn is *Hedychium coronarium*.

This plant is of the same natural order as ginger and cardamom, and grows profusely in Brazil as shown in the frontispiece taken from the Kew Bulletin.

It is propagated by root-stocks from which a crop in one year might be expected; from seed, two years would probably be required. It grows in damp localities near water courses at elevations ranging, in Ceylon, from sea level to 4,500 feet. In Brazil it has taken possession of land cleared for sugar which suggests that land suitable for the growth of sugar-cane would be suitable also for *Hedychium*. In that country it grows in a thick jungle to a height of from 3 to 6 feet; as many as 100 to 150 stems being counted in a square yard. After cutting down, a period of from 4 to 5 months elapses before a second crop is ready, the rainfall being about 60 inches per annum.

Root-stocks are continually reproduced so that continual cropping year by year would seem to be ensured.

YIELDS.

It is estimated that well-covered land with stems say 4 inches apart would yield 7 tons of raw dried fibre equal to 4 tons of paper per acre per annum.

In the neighborhood of Morretes in Brazil tracts of land of from 7,000 to 8,000 acres are covered with *Hedychium* capable, it is believed, of yielding at least 50,000 tons of dry fibre sufficient for the production of 30,000 tons of paper per annum. Another estimate gives 6-10 tons of dry raw material per acre per annum equal to 4 tons of pulp compared with 2 tons and 0.70 tons respectively of rice straw, 0.20 tons of pulp wood once in 40 years, and 1.35 to 1.57 tons of pulp from bamboo once in 5 years. *Hedychium coronarium* gives a greater weight of raw material per acre than any other product listed.

DISPOSAL OF RAW MATERIAL.

There are three methods of dealing with the raw material, the simplest being the drying and crushing between rollers of the stems after which they may be sent to Europe. This entails the payment of freight on a large proportion of unserviceable material.

Another method is to pulp the stems as is done with wood; a third method is to manufacture paper from the green stems on the spot. It is stated that the whole treatment from harvesting to the manufacture of paper need not occupy more than twenty-four hours.

No figures are available to show the cost of production of a ton of pulp or of the returns. Messrs. Clayton Beadle and Stevens obtained 4 per cent. and over of dressed fibre from *Hedychium* compared with 1½ per cent. from Manila hemp, the papers produced possessing a greater tensile strength than those of the strongest Manila papers. Owing to the semi-gelatinous nature of the cells a natural parchment can be made.

ITS VALUE FOR CEYLON.

As has been stated *Hedychium coronarium* occurs in Ceylon over a considerable range of elevation. In Brazil it takes possession of the land to the exclusion of all other vegetation but whether it would behave like that in Ceylon has not been ascertained. Its value will depend upon its power of spreading and reproducing stems. If it is found to flourish under irrigation it may prove a valuable product for our dry zone. There would

appear to be ground for thinking that it may prove suitable for cultivation under the tanks.

A closely allied species, *H. flavescens*, is more widely distributed in Ceylon than *H. coronarium*, but its value as a source of paper has not yet been ascertained. Some dried stems are to be sent home for trial and also root-stocks from which green stems may be obtained on the spot for manufacture.

R. N. L.

PLANTING SWEET POTATOES FROM SPROUTED TUBERS AND VINES.

The curator of the Botanic Station, Montserrat, has sent in the results of an experiment carried out to test the value of sweet potato cuttings taken from sprouted tubers as compared with cuttings taken from the vines in the ordinary way. It may be mentioned that similar experiments were conducted in Cuba some few years ago and reported on in the *Agricultural News*, Vol. VII, p. 120, where it will be found that the plots planted with slips returned a crop three and a half times as great as those planted with cuttings. In this experiment the gain of 350 per cent. fully repaid the extra expense and trouble involved.

In the recent Montserrat trials there has been no such phenomenal difference noticed, though the figures show there was, in the case of some varieties, quite a considerable increase in yield from the tuber cuttings compared with the vine cuttings. It is interesting to observe that no difference in vigor was noticed in the rows planted with the two kinds of material.

The following are a few of the yields which seem to be the most striking: Red Bourbon (ordinary vines) 114 lbs., (tuber cuttings) 145 lbs.; White (Gilkes (ordinary vines) 83 lbs., (tuber cuttings) 111 lbs. In no case did the tuber cuttings give a lower yield than the ordinary vines, but it is not established that the average increase is sufficiently large to warrant the systematic planting of tuber cuttings instead of ordinary vines. At the same time, the matter is worth serious consideration in the case of one or two special varieties.

It should be stated that as regards the size of the plots utilized in the experiments, the length of the row was 81 feet, the rows were 4 feet apart and the plants 2 feet. Each plot was therefore approximately 1/134 acre in area.—*Agricultural News*.

FERTILITY OF SOILS.

We have for long been forming the opinion which we now feel definite about, that it is not lack of fertility that is wrong with any soil here that will not grow good crops. A really poor soil is rare in Jamaica. The fertility is not gone, but the humus often is. The negative results in the majority of the experiments in bananas, cane and cocoa—which are the crops which have been most systematically experimented upon—in the use of fertilizers have helped us in coming to this conclusion.

In Dominica the application of a mulch on cocoa proved more profitable than the use of fertilizers, and as that is a country of heavy rainfall, it was not because the mulch conserved moisture, but because of the addition of so much humus. In Trinidad the experiments with fertilizers on cocoa have been mostly negative. Here the Department of Agriculture has had negative results with fertilizers on sugar canes and bananas, generally speaking. Yet the application of fertilizers on a leguminous crop shows visibly good results in the increased growth of the peas or beans grown as green dressings, compared with non-fertilized crops—and through the fertilized green dressings the bananas and cane benefit from the addition of a greater amount of humus containing stores of nitrogen, potash, phosphoric acid and lime.

Lands that would not grow bananas at all, now, simply through a thorough system of trenching, are growing magnificent fruit, yielding 80 per cent. hunches. Rich bottom lands that were beginning to give poorer and poorer results and yet are trenched, at once responded to a good application of lime.

All that is wanted, in addition of course to tillage, to make lands renew their youth, are (1) drainage, (2) humus, (3) lime.

The humus can be got by growing heavy crops of cowpeas, Jerusalem peas or overlook beans or Bengal beans, and the heavy crops of these can be secured by tillage aided by fertilizers, and as these legumes do not require nitrogen, they are economical. Nitrogen is the most expensive element in fertilizers.

Tillage, drainage, humus, lime, applied with knowledge and experience of different crop requirements will enable fine crops of any product to be raised.—*Jamaica Agric. Soc. Journal.*

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THE HAWAIIAN FORESTER AGRICULTURIST

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No. 7

This number contains the conclusion of the article on "Kalo," by Professor MacCaughy and Mr. Joseph S. Emerson, which was begun some months ago. It is probably the most exhaustive treatise on what has been called "the Hawaiian staff of life" which has ever been written.

FORESTER HOSMER'S DEPARTURE.

In the departure of Mr. Ralph S. Hosmer, for the past eleven years superintendent of forestry for this Territory, to take the headship of the school of forestry of Cornell University, Hawaii loses one of the most useful public officials that have ever been in its service. Having graduated from Harvard in 1894 with the degree of agricultural science, Mr. Hosmer was two years later appointed assistant in the division of soils in the United States department of agriculture. In 1902 he received the degree of master of forestry from the Yale forest school, and in 1903, upon the recommendation of Mr. Gifford Pinchot, was appointed superintendent of forestry for the Territory of Hawaii. Prior to his arrival here very little government forestry had been attempted, although the way had been pioneered to considerable extent by some forest planting in the environs of Honolulu, also by a good deal of foresting done by far-sighted sugar planters. For many years also the press had urged the importance of systematic forestation of the bald expanses on mountain and plain, and a standing committee of the Sugar Factors' Association issued annual reports on the subject charged with valuable information and inspiration.

Yet it was left to Mr. Hosmer to place the cause of public forestry upon a scientific footing, and how well he has acquitted himself of the task the records of the Board of Agriculture and Forestry attest. "At the end of the year 1913," Mr. Hosmer's latest annual report is quoted, "there were 34 forest reserves in Hawaii with a total area of 786,869 acres, of which 60 per cent (540,877 acres) was land belonging to the Territory." This is Mr. Hosmer's achievement in gross, but it falls very far short of being an inventory of his services to Hawaii. His introduction of useful trees, plants and seeds, by purchase and exchange; his personal interest in town improvement schemes, his advice always cheer-

fully given to citizens in the beautifying of their home plots, his enlistment of children's interest in forestry through Arbor Day exercises, are items of his enthusiastic devotion to duty which will add to community regret over his departure. Besides his superintendency of forestry he was chairman of the Territorial conservation commission and a regent of the College of Hawaii.

Socially, Mr. Hosmer will be greatly missed, as, besides his venerable mother and himself having during his stay been members of select circles, last January he brought a winsome bride here from Massachusetts, making Honolulu society rejoice in the feeling that now his home was established here. Cultivated and courteous, Mr. Hosmer has been highly esteemed personally, throughout his residence in Hawaii, by all with whom he has come in contact.

"Invest in the Tropics" is the title of a handsome paper-covered book issued by the publishers of The Tropical Mail, a new periodical fathered by the Tropical Agriculture Development Agency, Ltd., with the address, 17, Waterloo Place, London, S.W., England. The book is finely illustrated and filled with snappy articles on many tropical products, while the periodical is packed with similar matter but not illustrated.

An enterprise of the Massachusetts Forestry Association, which might well be imitated here, is that of conducting town forestry contests with prizes for tree-planting on streets.

Reports of the various divisions of the Board of Agriculture and Forestry for last month will repay perusal. They show effective work all round.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, May 31, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to report the following work accomplished during the month of May, 1914:

TUBERCULOSIS CONTROL.

The dairy stock of the following ranches and dairies were submitted to the intradermal tuberculin test under the new and improved method, viz., using the fold in the skin beneath the margin of the lower eyelid instead of the subcaudal fold:

	T.	P.	C.
Waialae Dairy	454	423	11
Pond's Dairy	418	417	1
J. Gouveira	13	12	1
M. Brazon	4	4	0
Nishimoto	8	8	0
M. Pacheco	7	7	0
M. Andrea	12	12	0
O. R. & L. Co. Ranch.....	683	674	9
J. M. Guerriero	10	10	0
J. Ferriera	1	1	0

From the above tabulated list it will be seen that during the past month 1590 head of dairy cattle have been tested with the result that 1568 were passed and tagged, and 22 head condemned and branded, giving a percentage of disease of 1.3%. Of the animals condemned on the Railroad ranch, one was an imported shorthorn bull which had been kept at Bellina's dairy for three weeks or a month and without doubt picked up the infection there; three were heifers born and raised on the place and in which the disease was in its earliest stages, and five were cows all of which had been in Bellina's dairy at some time or other and had carried the infection from there to Honouliuli.

POST-MORTEM EXAMINATIONS.

Opportunity was given to make several post-mortem examinations on cattle which had recently been condemned, the results of which were as follows:

No. 1. Jersey heifer, 3 years old, in prime condition, dressing about 300 lbs. The reaction at the point of injection was the smallest which has been observed under the new method, but was unmistakable in character. Lesions: Right retro-pharyngeal lymph gland enlarged to four times its normal size and rather flabby. On section the surface showed the effects of a productive inflammation, there being a great increase in the interstitial connective tissue, which was gradually drawing the parenchymatous tissue into lobules. There were, however, no macroscopic tuberculous lesions. The left lung showed numerous tuberculous nodules the size of a dime in both its cervical and diaphragmatic lobes. There was a large abscess in the liver.

No. 2. Grade Durham heifer; 2½ years old and in prime condition, dressing 347 lbs. Reaction of good size and well defined. Lesions: A very careful post-mortem examination revealed one of the mesenteric glands affected. The gland was enlarged to three times its natural size and filled with a gritty mass of tuberculous material; the only lesion of macroscopic size in the body; still the reaction was large, showing the hypersensitive condition of the tissues.

No. 3. Grade Jersey cow, six or seven years old, and in poor condition. Reaction medium in size. Lesions: The mediastinal lymph glands contained nodular masses of tuberculous material. The diaphragmatic lobes of both lungs contained large masses of inspissated tuberculous material with cavities opening directly into the bronchial tubes.

No. 4. Holstein heifer, two years old and in prime condition; reaction medium size. Lesions: The only lesion which could be found after a careful post-mortem examination was in the left retro-pharyngeal lymph gland, which was greatly enlarged and filled with small nodules about a quarter inch in diameter.

No. 5. Pure-bred Jersey bull in fine condition and dressing 687 lbs. Reaction very large, a swelling the size of an orange appearing at the point of injection. Lesions: The disease was in its earliest stage, there being few lesions. The retro-pharyngeal and mediastinal glands contained a few small nodules.

No. 6. Pure-bred Jersey bull in fine condition and dressing about 700 lbs. Reaction very large, though slightly smaller than in the previous bull. Lesions: The lesions were confined to the retro-pharyngeal glands and consisted of five or six nodules all about the same size, viz., three mm. in diameter. Lesions were not observed in any other part of the body, thus showing the infection to be of very recent origin.

In the above six cases practically all grades of reactions were observed, from the smallest to the largest, and with these reactions the corresponding stages of the disease as disclosed by the lesions on post-mortem examination, with the one exception of the generalized case, and a reaction in such a case would be of the small type.

A study of the different types of reactions to the intradermal test in connection with the amount of disease found on post-mortem examination has established a certain definite relation between the size of the swelling at the point of inoculation and the amount of disease present in the animal system, so that it may be laid down as a rule that the more recent the infection and consequently the fewer and smaller the number of lesions the larger will be the reaction.

Reactions of this method of testing, depending as they do on the anaphylactic condition of the tissues, will vary as this hypersensitive condition varies, and naturally the highest state of anaphylaxis will obtain when the tissues of the body are making their first fight against the invading organisms and the death-dealing toxins first begin to circulate in the blood stream.

When the disease has become established in the body and has formed larger or small localized lesions or has become generalized, the tissues, through habit and the long-continued presence of toxins circulating through them, gradually lose their highly-sensitized condition and so respond less to the injection of tuberculin.

But at no time after an animal has once become infected with tuberculosis do the tissues lose entirely their sensitiveness and thus show an immunity to the injection of tuberculin. Through their fight against the invasion of the disease they have become permanently altered; they are no longer the normal tissues they were before, but continue to show increased or decreased susceptibility to the injection of small doses of tuberculin.

IMPORTATION OF LIVE STOCK.

May 4—Sierra, San Francisco: 9 crates poultry.

May 5—Lurline, San Francisco: 18 crates poultry; 2 crates rabbits, 1 crate white mice, U. S. L. Ex. Station.

May 7—Hyades, Seattle: 4 crates poultry.

May 12—Wilhelmina, San Francisco: 16 crates poultry; 1 dog, E. Kilbourne.

May 15—Hongkong Maru, Orient: 2 crates black Minorcas, K. Machido.

May 18—Sonoma, San Francisco: 21 crates poultry.

May 19—Manoa, San Francisco: 1 horse, A. Schnerr; 6 hogs, J. W. Manning, Kahului; 1 crate chickens, H. C. & S. Co., Kahului; 40 crates poultry.

May 25—Hilonian, Seattle: 11 mules, Schuman Carriage Company.

May 26—Matsonia, San Francisco: 24 crates poultry; 1 dog, W. F. X. Company.

Respectfully,

L. N. CASE,

Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, May 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of May, 1914, as follows:

During the month 37 vessels arrived at the port of Honolulu, of which 25 carried vegetable matter and one vessel molding sand.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	840	14,188
Fumigated	4	64
Burned	22	23
Returned	1	1
Total inspected	867	14,276

Of these shipments, 13,991 packages arrived as freight, 152 packages as baggage of passengers and immigrants, and 133 packages by the U. S. mail.

RICE AND BEAN SHIPMENTS.

During the month 10,567 bags of rice and 1098 bags of beans arrived from Japan and after thorough inspection were allowed to land, being free from any pests.

PESTS INTERCEPTED.

Twelve packages of fruit and two packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being contraband, was burned.

A shipment of ornamental plants from Ohio was taken from the postoffice. It was infested with red spider, and after fumigation was allowed to be delivered. A package of rose plants was also treated on account of being infested with rose aphids. Three hundred fifty-one cases of apples were overhauled for spun-up worms in the boxes before they were permitted to land. Nine bags of coconuts arrived from Fanning Island and were treated with carbon bisulphide fumes before delivery. This is done more as a precautionary measure, because we often find species of beetles and other insects hibernating in the shipment. A few coconuts in this lot had a common scale insect (*Hemichionaspis minor*) on the stem ends; we also found a cricket.

BENEFICIAL INSECTS.

Six small packages arrived from Dr. Silvestri from Italy, containing *Staphylinid* beetles, enemies of hornfly, housefly, stablefly and other dung flies. As all these are shipped with manure I have been very cautious to take out all living beetles and then fumigate and destroy by burning all material left. Four of the packages contained 68 living beetles in good condition; in the two other packages all the beetles were dead on arrival.

Two lots of inoculated Japanese beetles were sent to Molokai, two lots were sent to Kauai and four lots were distributed on Oahu.

HILO INSPECTION.

Brother Newell at Hilo reports the arrival of nine steamers and one sailing vessel, of which six steamers brought vegetable matter consisting of 147 lots and 2259 packages which were found all free from pests and were allowed to land. There also arrived direct from Japan the steamer *Seiyo Maru*, bringing 6500 bags of

rice, 341 bags of beans, two bags of sesame seeds and two bags vegetable seeds; the last were fumigated as a precautionary measure, and the rice and beans were found free from weevil and rice moth.

While on the subject of Hilo inspection I beg to report that I have had two large tarpaulins made which could be used for fumigating purposes, should any rice or bean shipments arriving at Hilo be found infested with either pest. This matter was agreed to by the president of the board.

INTER-ISLAND INSPECTION.

During the month of May 58 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	53	packages
Taro	507	"
Fruit	42	"
Vegetables	5	"
		<hr/>
Total passed	607	"

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to plants:

Plants	17	packages
Fruit	3	"
		<hr/>
Total refused	20	"

Much of my time has been given to the distribution of parasites of the Mediterranean fruit fly in conjunction with Mr. Bridwell's work. The successful breeding of *Opis humilis* from many of the smaller fruits gives encouragement for the establishment of this parasite in the islands. We are sending out many strong colonies to all the islands, and we are keeping up the breeding of all parasites which Dr. Silvestri brought, as well as the two species Mr. Fullaway brought from Manila, and are making a special endeavor to breed and distribute the *Opis humilis* as much as possible during the present fruit season.

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, May 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the routine report of the Division of Forestry for the month of May, 1914:

FOREST FENCING.

Progress is being made on the several fencing jobs now under way on forest reserve boundaries, under contracts or agreements with the board, at Wailua, Kauai; Nahiku, Maui, and Kohala, Hawaii. At other places on Hawaii and Maui forest fencing required under government leases is also going forward. In the Kona district, Hawaii, an extensive project of rebuilding the forest fences on the boundaries of the private forest reserves of the Bishop Estate is pretty nearly completed. There are still a good many places that need attention both on government and privately-owned lands, but the end of this calendar year will see the forest reserves, public and private, throughout the Territory better protected than at any time previous.

During the middle of the month, May 12-18, I made a week's trip to Kona to arrange for the fencing of the Waiaha Spring forest reserve in North Kona, and to inspect the fence about the Honuaula forest reserve in the same district, which has recently been put in repair by the lessees of the adjoining government lands, Messrs. F. R. Greenwell and J. A. Maguire.

TREE PLANTING.

I was glad while in Kona to find a newly-awakened interest in tree-planting among several of the large landowners. On the lands of the Greenwell estate considerable tree-planting is contemplated in the near future. On the Captain Cook Coffee Company holdings a very promising plantation of Sugi (*Cryptomeria japonica*) has recently been established, and at Huchue, Mr. J. A. Maguire's ranch house, a plot of a number of species of eucalyptus is doing well. In the vicinity of Huchue the silk oak (*Grevillea robusta*) has become well established and is reproducing itself vigorously from selfsown seedlings.

Tree-planting in Kona is of particular importance because of the rapid deterioration of the native Hawaiian forest over large stretches of the upper lands. Especially in the koa belt the change from the former heavy forest to an open stand of rapidly-dying trees has been marked within the last few years. This condition is most noticeable on privately-owned lands in the center of the district that are used for grazing. It is not too late to redeem sections of this native forest if it were protected at once, but there

is no time to lose if it is to be saved. I strongly believe, and I so recommended to several of the owners, that, at least surrounding the water holes and swampy places, blocks of forest ought to be permanently maintained, sufficient in size to insure the continuance of both trees and undergrowth in healthy condition.

Kona is at best but very deficient in water supply. Every source is important. It ill behooves any landowner to let slip any opportunity, through protecting the native forest and through tree-planting, to conserve what sources of supply there are, and there is no question that the time for such action is now.

Tree-planting is also going on successfully on the other side of Hawaii. As a result of my visit in April to the Kukaiau ranch in Hamakua, I drew up early in May a statistical report on that project, for the information of the board and for future reference.

I am glad, in this connection of tree-planting, to call attention to several good-sized orders for seedling trees that have recently been placed with the Division of Forestry by sugar plantation companies. Details in regard to these orders will be found in the report of the forest nurseryman, which as usual is transmitted herewith.

FOREST RESERVES.

Several matters connected with the delimitation and administration of forest reserves have received attention during the month, more particularly on the islands of Hawaii and Oahu, together with about the usual amount of routine and retail. At a meeting of the commissioners held on May 8, two volunteer forest rangers were appointed, respectively for Manoa Valley, Honolulu, and for the Honolulu Watershed forest reserve in general, Messrs. E. H. Hipple and Charles L. Deal. Through the coöperation of these non-salaried officials it is hoped to secure better protection for the government land in this important forest reserve.

EXPERIMENTAL TREE-PLANTING.

Consignments of tree seed from foreign countries continue to be received from time to time by the Division of Forestry. Much of the seed now coming in is the result of requests made by Mr. J. F. Rock during visits to various botanic gardens in the Orient last winter. The seeds are being propagated and cared for at the government nursery and at the Makiki station.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, May 31, 1914.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of May:

*Nursery.**Distribution of Plants.*

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold .....	....	400	261	661
Gratis	6000	890	1620	8510
	6000	1290	1881	9171

COLLECTIONS.

Collections on account of plants sold amounted to.....	\$ 1.25
Rent of building, nursery grounds, for the months of March and April	70.00
Total	\$71.25

Plantation Companies and Other Corporations.

Under this heading we have received orders and distributed plants amounting to 19,400 in seed boxes, 1800 in transplant boxes and 50 pot-grown; total, 21,250.

We have also received an order for 50,000 eucalyptus seedlings to be delivered before the end of the year.

Experimental Garden, Makiki.

The work at this station has consisted principally of routine connected with the transplanting of seedlings, mixing and sterilizing soil and doing some needed repairs to the road leading to the station.

Honolulu Watershed Planting.

During the month 174 trees were planted out and 896 transplanted into tin cans. The species were all koa and kukui. The greater part of the month was spent in hoeing the trees previously planted.

Advice and Assistance.

The number of applicants for advice and assistance is as follows: By letter from the other islands, 4; by telephone, 6; calls for advice at the nursery, 7; calls made at the request of people in different parts of the city, 3.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, June 9, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography for the month of May, 1914, is respectfully submitted:

KAUAI.

Weather conditions were most unusual. Much rain fell on the lowlands with but few storms. The mauka rainfall was very light in total, while the entire northern end of the island had almost continual rainfall. The clock register station on the Lumahai stream at an elevation of 750 feet was completed under conditions of almost continuous rainfall.

Rain gages, with evaporation gages, were established on the Lumahai and Kalihi-wai streams at the 750-foot elevation.

The clock register station on the South Wailua river near Lihue was found to be at a standstill. The cause was found to be a bees' nest in the float well, which contained a half bushel of honeycomb.

Work was started on the new Waioli stream clock register station trail on May 24. A station will be established on this stream (which is government water) at an elevation of about 700 feet. A new trail about $2\frac{1}{2}$ miles in length will have to be built to reach this station.

Fifteen stream-gaging stations and seven rainfall-measurement stations were visited during the month.

OAHU.

Oahu was well supplied with rainfall during the month. Records for the stations along the Koolau range were spoiled by being tampered with by unknown persons. It has been decided best to discontinue these stations and reestablish them at points

lower down in the Honolulu basin, off the trails and more centrally located in the rainfall catchment areas.

Two new clock register stations were constructed on the two main branches of the Manoa stream, above all diversions. The data to be obtained will be of immense value in connection with Honolulu's water supply.

The instrument was installed on the new clock register which was completed on the Punaluu stream in April.

Arrangements were made during the month for the installation of six new clock register cooperative stream-gaging stations, and one clock register ditch-gaging station. The stations are to be built during June and July, and are to be operated by this office. All equipment, material and construction cost will be borne by the cooperating parties, while the hydrographic division will oversee the construction and installation, and will maintain, operate and rate the stations in the future.

The cooperating parties are as follows:

Kahuku Plantation Co.—Three stations to measure the run-off of the main Malaekahana, middle branch of the Malaekahana, and Kahawainui streams.

Laie Plantation Co.—Two stations to measure the run-off of the Waialele and Koloa streams.

U. S. Army—One station to measure the run-off of the south fork of the Kaikonahua stream, below the storage reservoir of the Schofield Barracks water supply. Also one ditch station to measure the inflow from the ditch into the reservoir.

Ten stream-gaging stations and four rainfall-measurement stations were visited during the month.

MAUI.

Maui also received an unusual amount of rainfall during May, which was well distributed, and there were no large floods.

The old staff gage on the Waikapu stream was washed away, and a new gage was established at a new datum.

Thirty-two stream-gaging stations were visited and 36 measurements were made.

GENERAL.

The 1913 data have been completed, blue printed, and are now ready for distribution. Blue prints of data are being mailed to all public officials, plantations, ranches, etc., to whom these data may be of value.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

THE KALO IN HAWAII (Conclusion).

By VAUGHAN MACCAUGHIEY and JOSEPH S. EMERSON.

THE MAKING OF POI BY MACHINERY.

In recent years machine-made *poi* has been put upon the market. The Kalihi Poi Factory, in Honolulu, produces large quantities of this product. It is claimed by some that the machine-made *poi* is inferior in flavor and general quality to the hand-made *poi*, but the gain in sanitary methods of production greatly overbalances any such differences that may exist. Hand-made *poi* can be no cleaner than its makers, and those who have witnessed the methods of many "poi-shops" have indelible corroboration of this fact.

Machine-made *poi* is made thus: The corms are washed, boiled in large drums by means of steam, and peeled by hand. The peeling is done by women, working under sanitary conditions. The peeled corms then pass through a machine that resembles a gigantic meat-chopper, water is added as necessary, and the *poi*, of uniform texture, comes out of the bottom of the machine and is put into barrels.

OTHER USES OF THE KALO CORM.

In addition to this extensive use of *kalo* for *poi*, a considerable quantity is dried and ground into "taro flour" or "taroena". Taro flour has been on the market for several years, and is used successfully as food for infants, invalids, and other persons who require an easily-digestible food. About 70% of the peeled corm is water, so the shrinkage in drying is large. However, when once dried and ground, the flour will keep indefinitely, if protected from moisture, without becoming musty.

The following copy of the label on a "taro flour" produced locally will be of interest:

ARMSTRONG'S COOKED TARO FLOUR.

Prepared by McCandless & Armstrong, Pearl City, Territory of Hawaii.

TARO FLOUR is made from the Taro Plant, the principal food used by the natives of the Hawaiian Islands. It is cooked, ready for use, has an agreeable taste and possesses more nutriment than any other known food. It can be mixed with milk or water. It is easily digested by the most delicate stomach and never rejected. It will keep in any climate; neither age nor insects affect its nutritive qualities. Recommended by all physicians.

DIRECTIONS FOR USING TARO FLOUR AS AN INFANT FOOD.

Infants under three months, one-half teaspoon of Taro Flour; cow's milk one-half pint, hot water one-half pint; dissolve the flour by adding to



HARVESTED FIELDS

Note the gunny sacks filled with cobs, the leaves cut off and thrown into the patches, the distant ocean and harbor



KALO READY FOR TRANSPORTATION

Note good wagon road, sacks of coirns, pile of leaves for swine food, fields of young kalo, workmen bunching, Chinese cabins, steep valley walls

the hot water slowly; stir until well mixed, then add the milk. If lumpy, strain before using. For younger infants use more water. For older infants use more milk and less water. Mothers can use their own judgment in preparing the food. Once tried, always used. Unequaled as a food for dyspeptics and invalids. No distress after eating it. It contains no mixture. Is made of selected Taro only. Made under sanitary conditions and warranted pure Taro Flour.

DIRECTIONS FOR USING TARO FLOUR AS AN INVALID'S FOOD.

Two tablespoonfuls of Taro Flour in a glass of milk; stir well; add sugar or salt to taste.

Poi—Cook as mush and eat with milk or let stand one or two days until a little sour. Eat with meat or fish cold. For a drink, put two or three spoonfuls in a glass of water. It is very refreshing in the morning.

Can be used as other flours for mush, but for cakes, doughnuts or bread add a little wheat flour.

In case of seasickness it is the only satisfactory food.

THE FORCING AND BLANCHING OF DASHEEN* SHOOTS.

Abridged Statement by Robert A. Young, Bureau Plant Industry,
U. S. D. A.

"As the growing of the dasheen as a tuber crop begins to assume commercial proportions, it seems desirable to make available to growers and others who may be interested the details of a special treatment of the corms (large spherical tubers) by which a delicate fresh vegetable for winter use may be obtained. Credit is due to Mr. P. H. Dorsett, of the Bureau of Plant Industry, for the original suggestion of raising the shoots in this way.

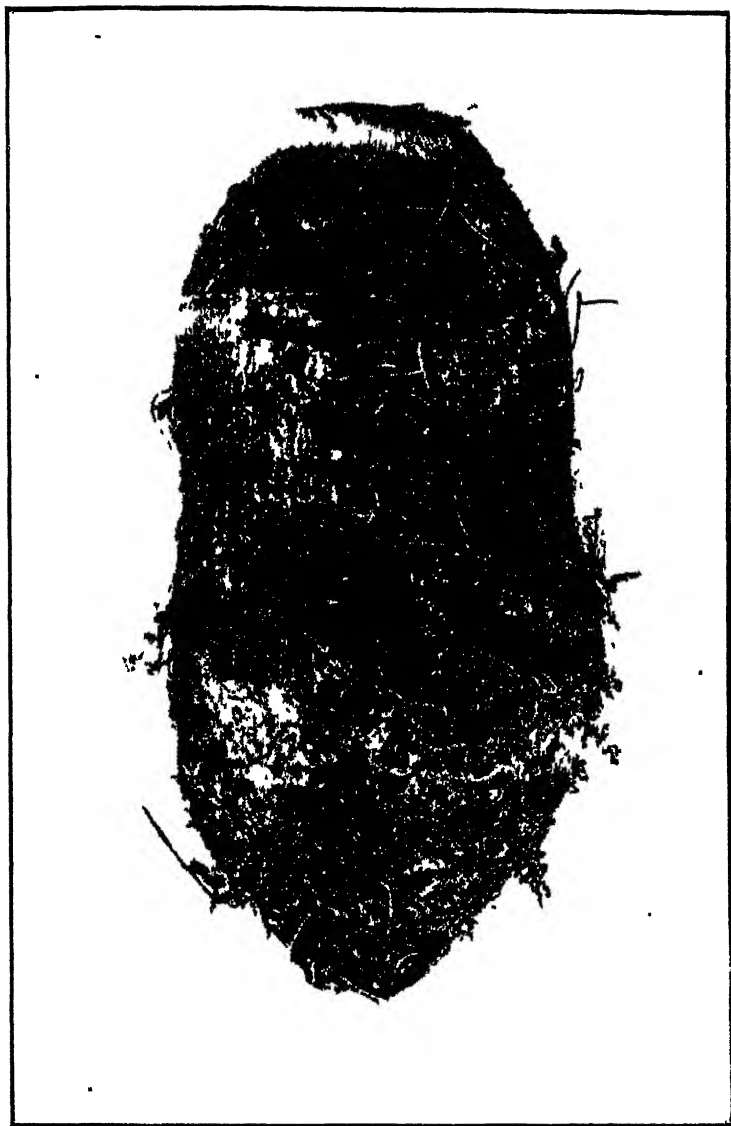
"The young blanched shoots of the dasheen make a very tender and delicious vegetable and are used much like asparagus. The flavor is delicate and is suggestive of mushrooms. In order to destroy a slight acidity, a special method of cooking is required.

Culture.

To obtain the shoots, corms weighing 2 to 3 pounds or more, are planted in a fairly warm place in very moist sand or sandy soil. A half-and-half mixture of sand and ordinary potting soil has given good results. The corms are just covered, the terminal bud being at the surface. Provision must be made for keeping the shoots in total darkness from the time they begin to grow. Water should be supplied often enough to keep the sand or soil continuously moist.

Several ways of forcing and blanching dasheen shoots have been tried, and all have been successful in that satisfactory shoots were

* In this abstract *dasheen* is used as synonymous with *kalo*.



CORM OF PI'IALI'T ULAULA.
Weight: 598 grams. Dimension: 15.5 cm. x 8 cm.

grown. In the first experiments made by the Department, both sand and sphagnum moss were used in which to plant the corms. In one of these blanching was accomplished by keeping the shoots covered with sand, while in the others a frame covered with several thicknesses of burlap was used. The boxes in which these experiments were carried on were placed in a warm greenhouse on a bench that was supplied with bottom heat.

"Neither of the foregoing methods is adapted for use where the production of shoots on a large scale is desired. For such a case, provided the weather is not too cold and a suitable greenhouse is available, a bed may be prepared under a bench. The space may be darkened by hanging several thicknesses of heavy paper or burlap from the sides of the bench. This plan is suited to the spring of the year, while those methods by which bottom heat can be applied may be used at any time after the corms become available, in the late fall or early winter.

"The method which is probably best for large scale production is to use a raised bed provided with bottom heat. A cover, practically light proof and with sides 18 to 24 inches high, is required. The temperature inside this should be about 70°F. The soil (or sand) should be a little warmer, say, 80°. To obtain this temperature it is best to partially inclose the space beneath the bed.

"The first crop of shoots is usually ready for cutting in 35 to 40 days after planting. From 6 to 10 cuttings can be made at intervals of 10 to 14 days, depending upon temperature and the size of the corms used. The shoots are cut close to the corm, and, as far as practicable, before the leaves begin to expand. They will then usually be 8 to 16 inches long.

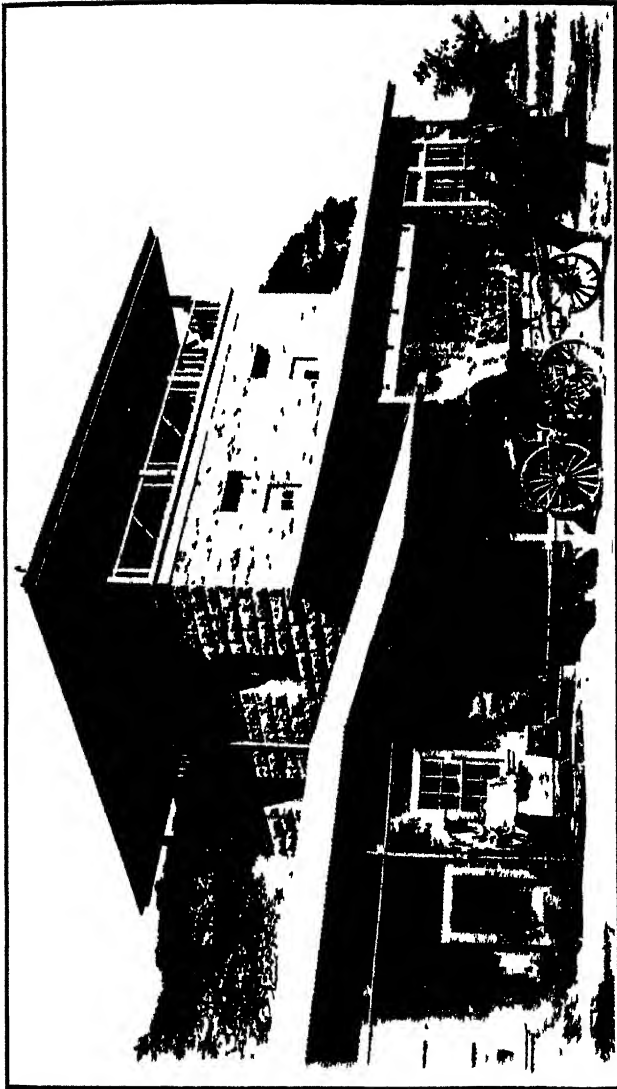
"After the corms become exhausted, which is indicated by the weak growth of the shoots, they are discarded.

"Out of doors in a warm region, as in Florida, the corms may be planted in rows in sandy soil and the shoots blanched by ridging up the soil as growth progresses. Instead of ridging the soil, boards may be used, as in blanching celery, but the shoots must not at any stage of their growth be exposed to light for any considerable length of time.

Handling and Keeping.

"The shoots have been found to keep well for several days if in a cool, dry place. As they are very succulent, however, it is better that the period of storage be very limited—not over two to four days when avoidable. A little ventilation is necessary, but as the shoots soon wilt if evaporation is too rapid, a paraffined paper should be used in wrapping and a slight opening left.

"Sometimes, when the shoots are to be kept for only a day or two before using, it may be advisable to wrap first in wet paper and then with paraffined paper, especially if the place where they are to be kept is not quite cool enough.



THE KALIHI POI FACTORY, HONOLULU.

The machinery for making the poi is housed in the central stone structure. The open upper floor contains water tanks. The second floor contains the steel drums in which the corns are cooked. The ground floor contains the cleaning and grinding machinery. The wooden structure to the left is the boiler and engine room. The lean to on the right is the business office. The porch against which the wagon is backed is the distributing or selling area. Several barrels of poi may be seen on this porch.

RECIPIES FOR THE PREPARATION OF THE DASHEEN.

"This vegetable is a staple article of food for millions of people in tropical and subtropical countries. In general it is used in the different ways in which the white potato is used. It may also be candied like the sweet potato. The flesh of the corms and large tubers is frequently somewhat gray or violet when cooked, but this does not affect the flavor.

"When uncooked dasheens are being scraped or pared they should be handled in water to which a teaspoonful of sal soda to the quart has been added, in order to prevent irritation to the hands.

Baked Dasheens.

"Dasheens, large or small, may be baked like potatoes, in a quick oven. They should first be washed and scrubbed to remove the fibrous part of the skin. When practicable to do so it is often desirable to scrape the dasheens before baking, as they are then more convenient for eating and the soft crust which forms when they are properly baked is particularly delicious. The corms may be cut in half from top to base in order to lessen the time needed for baking. The time required is about the same as for potatoes of the same size. They should be served hot. Season with salt and plenty of butter, and pepper if desired. Gravy instead of butter may be used.

"The dasheen when properly baked and served is mealy and the flavor is much like that of the white potato, but more or less suggestive of chestnuts. If not overbaked, the skin when properly scrubbed or scraped beforehand will be found of delicious flavor. As the dasheen is drier than the potato it requires more butter.

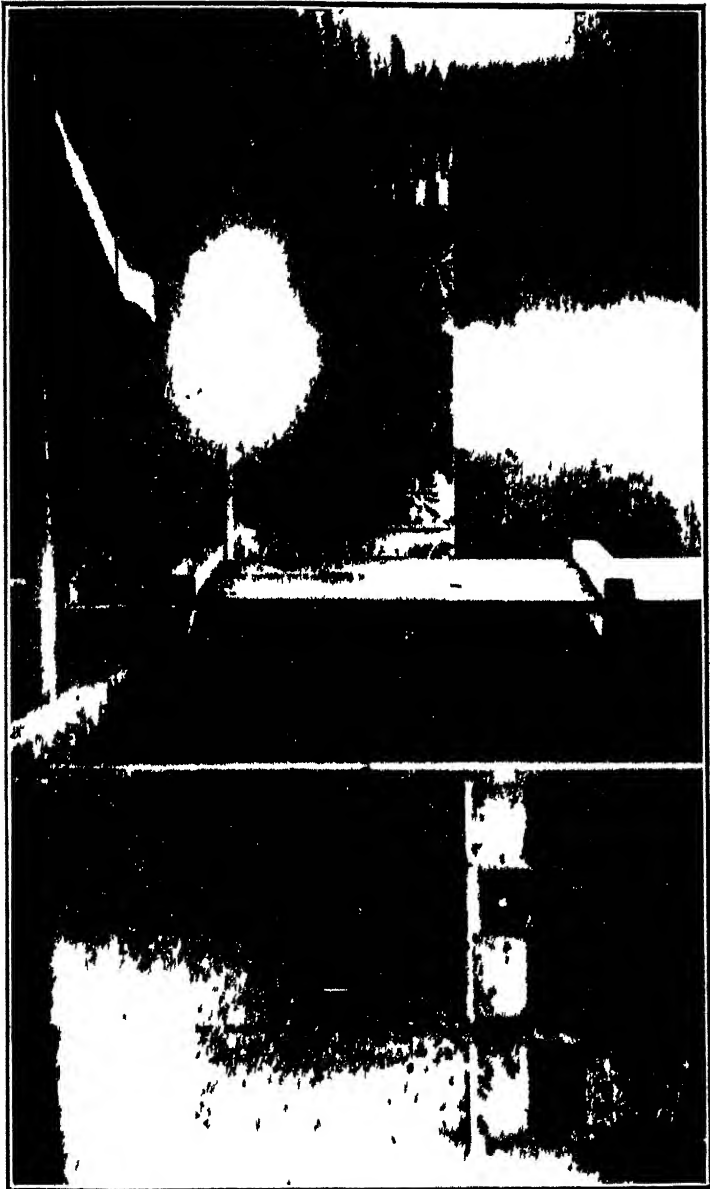
Stuffed Dasheens.

"Proceed the same as in baking, and when the dasheens are done follow the method used for stuffed potatoes, using more butter, however. If cream instead of milk is used for moistening, still better results are secured.

"The corms are especially adapted for serving in this manner, but they should always be scraped and, unless quite small, may be cut in half. Instead of mashing dasheens it will always be found better to scrape them with a potato scraper or to rub them through a coarse sieve.

Scalloped Dasheens.

"Pare raw dasheens and slice thin, putting in layers in a well-buttered baking dish, seasoning each layer with salt and butter and sprinkling each lightly with flour. Nearly cover with rich milk and bake.



KALIHI POI FACTORY.

View in washing room, looking across vats through doorway into receiving room. The washing vats are of wood, and are about four feet deep.

"This method of serving the dasheen will be found particularly well adapted for banquets and formal dinners, but in such case individual baking dishes or casseroles should be used.

"The above recipe may be varied by using less butter and adding grated cheese. Pepper may also be used in seasoning if desired. Cold boiled instead of raw dasheens may also be utilized in these recipes."

KALO FOR STARCH.

Kalo is not suitable for the manufacture of starch, for the grains are very small, being only 1/25,000 to 3/25,000 of an inch in diameter. The small size of the starch grains prevents their rapid settling in water, in which the grated corn has been put, so viscid that the starch grains will not settle. The manufacturing value of a starch depends, of course, largely upon this ability to settle in water.

The ancient Hawaiians used the kalo for a variety of purposes, in addition to its fundamental use as food. Kalo was used as a medicinal agent; was an important accessory in many of the *kahuna* practices; and a number of the varieties were especially suitable for offerings to the gods or *aumakua*.

KALO FOR MEDICINE.

The medicine or *apu* was used for various pulmonary disorders. *Apu* refers primarily to the cup fashioned from a well-ripened coconut shell cut longitudinally, used for drinking awa and other unpleasant liquids, but not employed for ordinary drinking water. *Apu*, the medicine drunk from such a cup, was prepared as follows: A kalo corm is used preferably of the variety called *kalo-lau-lou-haululi*. This is much less acrid to the taste when raw than other varieties of kalo. Other varieties having a similar characteristic are used. The corm was grated by scraping off portions with an *opihi*, limpet shell. To this was added grated coconut, and the pasty mass was well mixed with some water and strained in the same manner as *awa*. The strainer used was the dry fiber of the *ahu awa*.

The pulpy mass was enclosed in this fiber and the liquid forcibly wrung out. The refuse was shaken out of the fibers of *ahu awa*, which were now arranged in the shape of a funnel. On being poured through this strainer thus adjusted, the liquid came out quite clear.

Seeds from the *pilikai* (*Agregia tilaefolia*? *Ipomea Turpen-thum*?) were finely pulverized and mixed with a portion of the liquid in the proportion of about a teaspoonful to a tumblerful of the liquid.

For four successive mornings the patient takes a cup, *apu*, of the liquid without the *pilikai*, and on the fifth morning a cup of



KALIHI POI FACTORY.

Another view in washing room, showing cement floor, a small vat, and endless-chain elevator for transporting the washed corms to the cooking drums on the second floor.



KALIHI POI FACTORY

Revolving drums in which the corms are cooked by means of steam and device for revolving the drums

Note conveyor over the drums, steam pipes



KALIHI POI FACTORY

Sheet iron tank in which the poi barrels are thoroughly cleaned in scalding water By this treatment the barrels are used repeatedly, like milk bottles

the same to which the *pilikai* has been added. These five cups are respectively called: *kua-kahi*, *kua-lua*, *kua-kolu*, *kua-ha*, and *kua-lima*. The *kalo* is the efficient medicinal agent relied upon. The coconut is added simply to neutralize the acrid taste of the *kalo* and make the medicine more agreeable to the taste. The *pilikai* serves as a powerful cathartic to remove the last trace of the medicine from the system.

KALO FOR KAHUNA RITES.

The following varieties of *kalo* were all considered suitable for the various *kahuna* practices of ancient times, and for offering to the gods, *aumakua*:

Lauloa manini. This *kalo* is considered to be the best of all for *kahuna* purposes.

Piialii. Three kinds; two are for *kahuna* practices—*Piialii ulaula*, *Piialii keokeo*.

(*Piialii melemele*—yellow—is not used by the *kahuna*.)

Manini ha kikokiko.

Ha'okea. Three kinds; all used by the *kahuna*—*Ha'okea hau-liuli*, *Ha'okea keokeo*, *Ha'okea hau laula*.

Popolo.

Apiikca.

Ieie.

Uahi-a-pele.

Kumu-ulaula; keokeo.

Only the *oha* or offspring of the central corm were used. These corms when small were roasted on hot coals and all the burnt portions were scraped off with an *opihii* (patella) shell or a knife. *Lu'au* made from the leaves of any of the above list were also used for the same purpose.

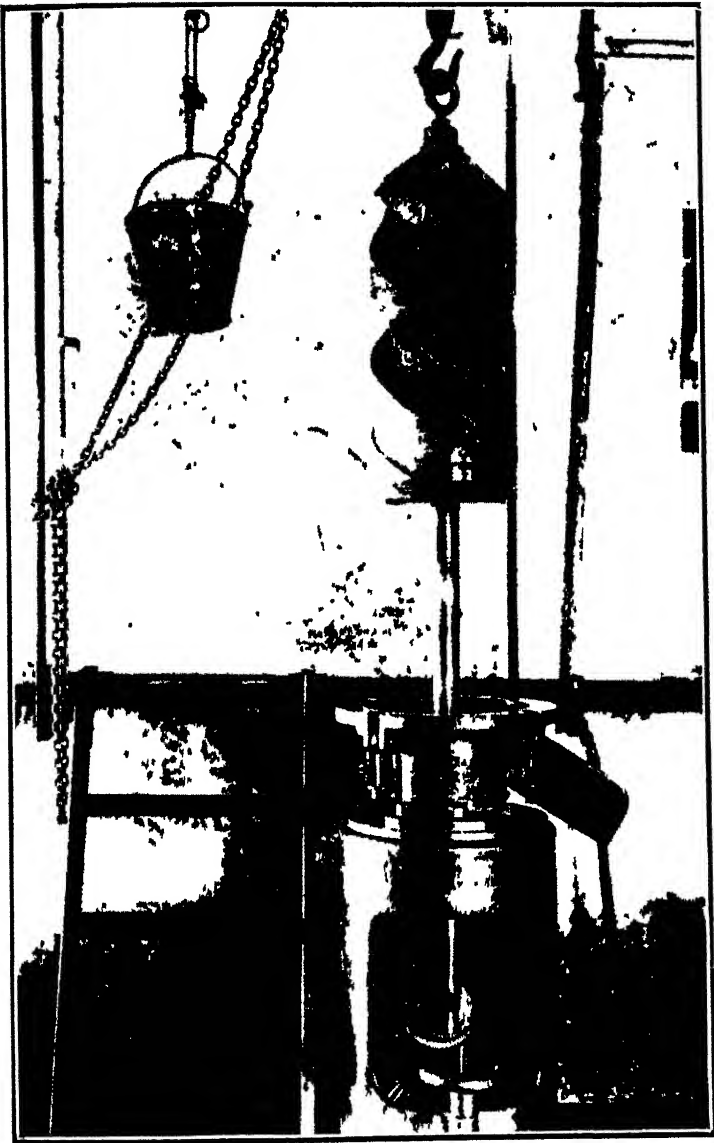
The Hawaiians made a pudding called *ku-lolo* of *kalo* and coconut, which is very good. Another dish is prepared by grating, *olo*, the corm on a rough stone, and then cooking it. This is called *piepiele*.

ADDENDA 1. WORK OF HILO BOARDING SCHOOL.

Glenwood.

Professor MacCaughey.

Dear Sir:—There occurs a statement in your article on taro which is founded on a misconception and which I would like in some way to have corrected. You state that the U. S. Experiment Station is collecting and planting varieties obtainable at the present time. This is unjust to the Hilo Boarding School, which is the institution doing this work, and has at the present time about sixty separate varieties under cultivation. I wish, therefore,



KALIHU POI FACTORY.

After thorough cooking the corms are peeled by hand, sorted, and fed into this grinding machine. During the grinding process water is added in sufficient quantities to give the proper consistency. The grinding is done by the large vertical screw-shaped pestle, which revolves in a cylindrical chamber.

you would be so good as to have a note inserted in the Forester giving the Boarding School credit for the really excellent work that Mr. Lyman has been carrying on since long before I ever heard of the institution, in spite of the fact that I seem to have come in and carried off the glory. Yours very truly,

F. A. CLOWES,
Superintendent Hawaii Substations.

ADDENDA 2. THE NAME "DASHEEN".

Washington, D. C., January 24, 1914.

Dear Prof. MacCaughey:—In connection with our use of the name "dasheen," I would say that while I had a feeling when in Hawaii that we might find it advisable to drop this name and take up the better known name "taro," I found that there was a rather strong feeling on the part of a good many persons that we ought to stick to the name "dasheen," particularly as the plant had become fairly well known under that name in a good many places. Various other arguments have been advanced both for and against the retention of the name, but my superiors finally decided that the name should be retained.

The derivation of the word is now easily traced to the French, and this case seems to be precisely similar to that of the origin of the French word for turkey, *dinde*, which was originally *d'Inde*. I realize that those who have known the taro will hardly become reconciled to this word dasheen, but as comparatively few people on the mainland are acquainted even with the former word, and many thousands are now more or less familiar with the name dasheen, I think the question is probably settled here for all time. Very sincerely yours,

R. A. YOUNG,
Scientific Assistant.

(The End.)

*ALFALFA—A PROMISING FORAGE CROP FOR
HAWAII.*

(Continued.)

The following tables show the exact amounts expended on the alfalfa field, the actual cost of production, and the total yields up to June 1, 1913—nine months and ten days after seeding:

COST OF PRODUCTION.

POISONING.

Formula:

5 lbs. bran at 1.5c.....	\$.075
5 lbs. mid's at 1.5c.....	.075
1 lb. brown sugar.....	.05
1 lb. white arsenic.....	.05
1 qt. water.....	...

Total\$.250

Cost per $\frac{1}{8}$ -acre plot (3 times quantity).....\$.75

Cost per acre 6.00

WEIGHING.

Per cutting per $\frac{1}{8}$ -acre plot—2 men, 1 hr. at \$1.50

per 9-hour day\$.33

Per cutting per acre..... 2.64

IRRIGATION (FLOODING).

	UTAH—Plot No. 1			ARABIAN—Plot No. 2			KANSAS—Plot No. 3			AUSTRALIAN—Plot No. 4		
	Date	Amt.	Cost	Date	Amt.	Cost	Date	Amt.	Cost	Date	Amt.	Cost
	1912	Hrs.		1912	Hrs.		1912	Hrs.		1912	Hrs.	
	Sept. 1...	2	\$.33	Sept. 1...	2	\$.33	Sept. 3...	2	\$.33	Sept. 3...	2	\$.33
	" 15...	2	.33	" 15...	2	.33	" 16...	2	.33	" 16...	2	.33
	" 26...	2	.33	" 26...	2	.33	" 26...	2	.33	" 26...	2	.33
	Oct. 17...	1	.16									
	1913			1913			1913			1913		
	Mar. 6...	21½	.41	Mar. 5...	2	.33	March 4...	3	.49	March 3...	2¼	.37
Per Plot, ¼ Acre..	Total	91½	\$ 1.56		8	\$ 1.32		9	\$ 1.48		8¼	\$ 1.36
Per Acre (Cal.).....	Total	76	\$12.48		64	\$10.56		72	\$11.84		66	\$10.88

WEEDING AND CULTIVATION.

VARIETY	UTAH			ARABIAN			KANSAS			AUSTRALIAN		
	Date	Amt.	Cost	Date	Amt.	Cost	Date	Amt.	Cost	Date	Amt.	Cost
Planet Jr.....	1912 Sept. 5...	Hrs. 2	\$.33	1912 Sept. 5...	Hrs. 2	\$.33	1912 Sept. 5...	Hrs. 2	\$.33	1912 Sept. 5...	Hrs. 2	\$.33
"	" " 17...	2	.33	" " 17...	2	.33	" " 17...	2	.33	" " 17...	2	.33
"	" " 22...	2	.33	" " 22...	2	.33	" " 22...	2	.33	" " 22...	2	.33
Hand.....	Oct. 14...	9	1.50	Oct. 15...	9	1.50	Oct. 16-17.	9	1.50	Oct. 17-18	9	1.50
"	Nov 1-3...	9	1.50	Nov. 4-8...	9	1.50	Nov. 8...	9	1.50			
Planet Jr.....	" 14...	2	.33	" 15...	2	.33						
"	1913 1/29-2/7...	2	.33	1913 Jan. 20...	3	.49	1913 Feb. 10-18.	2	.33	1913 Feb. 20-25	2	.33
"	3/27-4/1...	2	.33	Mar. 4-5...	2	.33	Apr. 17-25.	2	.33	4/28-5/14.	2	.33
"	May 19...	2	.33	Apr. 9-16...	2	.33	May 22...	2	.33			
"				4/28-5/4...	2	.33						
Total per Plot.....		32	\$ 5.31		35	\$ 5.80		30	\$ 4.98		19	\$ 3.15
Tl. per Acre (Cal.)..		256	\$42.48		280	\$46.40		240	\$39.84		152	\$23.20

ACTUAL YIELDS OF FODDER PER 1/8 ACRE PLOTS.

UTAH					ARABIAN				
Plot No. 1—Sown August 20, 1912					Plot No. 2—Sown August 21, 1912				
Cutting	Date	Yield, Lbs., Green	Calculated Tons per Acre		Cutting	Date	Yield, Lbs., Green	Calculated Tons per Acre	
			Green	Hay				Green	Hay
1	1912	40	.16	.03	1	1912	94	.38	.07
2	10/26	189	.75	.15	2	10/15-16	173	.69	.14
3	11/1	637	2.55	.51	3	11/4	672	2.69	.54
4	12/10-16	1178	4.71	.94	4	12/12	- 574	2.30	.46
5	1913	2172	8.69	1.74	5	1913	298	1.19	.24
6	1/29-2/7	2310	9.24	1.85	6	3/4-5	1115	4.46	.89
	3/27-4/1				7	4/9-16	1036	4.14	.83
	5/19					4/28-5/14			
Total.....		6526	26.10	5.22	Total.....		3962	15.85	3.17

* Plants over mature; had begun to collapse.

ACTUAL YIELDS OF FODDER PER 1/8-ACRE PLOTS.

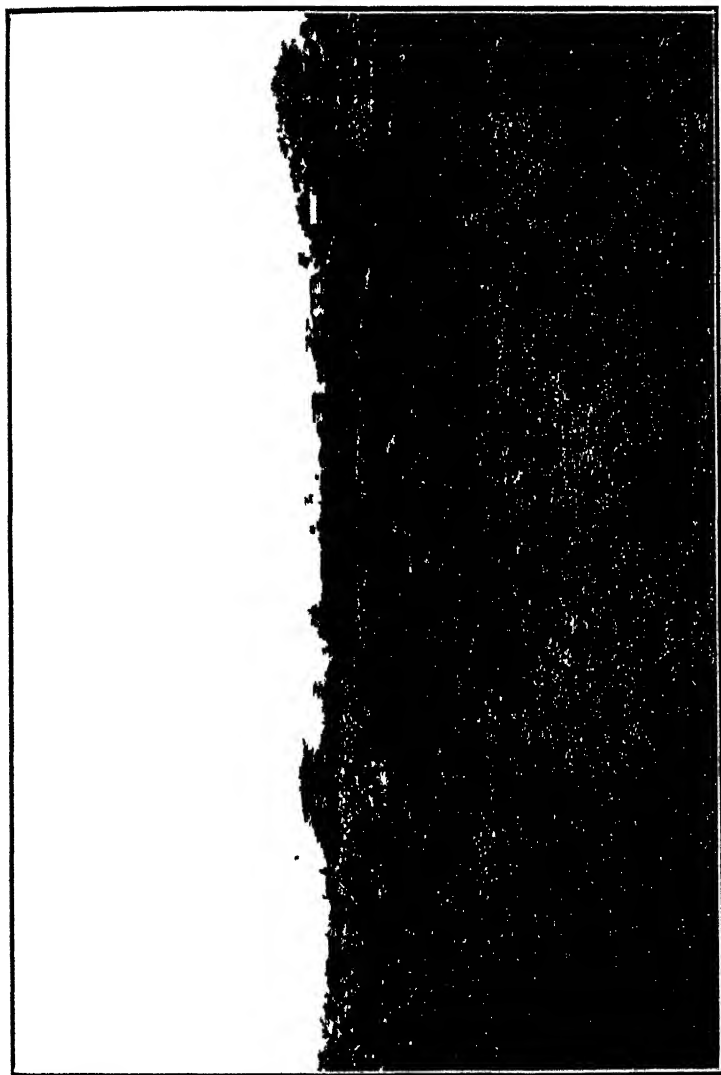
KANSAS						AUSTRALIAN					
Plot No. 3—Sown August 22, 1912						Plot No. 4—Sown August 22, 1912					
Cutting	Date	Yield, Lbs., Green	Calculated Tons per Acre			Cutting	Date	Yield, Lbs., Green	Calculated Tons per Acre		
			Green	Hay					Green	Hay	
1	1912 10/16-17	160	.64	.13	1	1912 10/18	167	.67	.13		
2	11/8	186	.74	.15	2	11/12	260	1.04	.21		
3	12/17-20	765	3.06	.61	3	12/24-30	603	2.41	.48		
4	1913 2/10-18	927	3.71	.74	4	1913 2/20-25	625	2.50	.50		
5	4/17-25	1838	7.35	1.47	5	4/28-5/14	2096	8.38	1.68		
6	5/22	2076	8.30	1.66							
Total.....		5952	23.80	4.76	Total.....		3751	15.00	3.00		

COST OF PRODUCTION PER ACRE.

Variety	Utah	Arabian	Kansas	Australian
*Plowing (one deep).....	\$ 5.00	\$ 5.00	\$ 5.00	\$ 5.00
'Discing (3 times).....	5.00	5.00	5.00	5.00
Inoculation	2.00	2.00	2.00	2.00
Land Rental (yearly).....	20.00	20.00	20.00	20.00
Seed at 15 lbs. per Acre....	3.25	3.25	3.25	3.25
Seeding (drilling)	2.50	2.50	2.50	2.50
Reseeding and Seed.....	1.00	1.00	1.00	1.00
Irrigation	12.48	10.56	11.84	10.88
Weeding and Cultivation....	42.48	46.40	39.84	25.20
Poisoning	6.00	6.00	6.00	6.00
Harvesting at \$5.....	30.00	35.00	30.00	25.00
Weighing, etc., at \$2.64....	15.84	18.48	15.84	13.20
Total Cost	\$145.55	\$155.19	\$142.27	\$119.03
Total Receipts at \$5 per Ton Green	\$130.50	\$ 79.25	\$119.00	\$ 75.00
Total Receipts at \$27 per Ton Hay	\$140.94	\$ 85.59	\$128.52	\$ 81.00

¹ Including depreciation of machinery.

(To be Continued.)



Harvesting alfalfa at College farm, July, 1913, yielding at the rate of over 8 tons of green fodder per acre. Total acre yield for year ending December, 1913, 69,200 pounds green fodder.

BY AUTHORITY.

AMENDMENT TO RULE XVIIII OF THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY CONCERNING THE CONTROL OF FUNGUS DISEASES ON PINEAPPLES.

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby amend Rule XVIII of the Board of Commissioners of Agriculture and Forestry concerning the control of fungus diseases on pineapples by changing the words "Island of Kauai" wherever the same appear, to read "Islands of Kauai and Oahu," so that the said Rule shall read as follows:

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following rule and regulation for the purpose of preventing the spread of a fungus disease upon pineapples which has made its appearance upon the Islands of Kauai and Oahu:

SECTION 1. All persons and corporations are hereby prohibited from carrying, transporting or shipping from the Islands of Kauai and Oahu to any other Island in this Territory any pineapple fruit, pineapple plant or pineapple sucker.

SECTION 2. No pineapple fruit, pineapple plant or pineapple sucker shipped from any port of the Islands of Kauai and Oahu to any other port in this Territory shall be allowed to be landed. Inspectors and other duly appointed agents of the Board of Agriculture and Forestry are hereby empowered to examine and inspect all freight, baggage and belongings arriving at any port of the Territory from the Islands of Kauai and Oahu and to destroy any and all pineapple fruits, plants or suckers found among such freight, baggage or belongings.

SECTION 3. Any persons violating the above rule shall be guilty of a misdemeanor and upon conviction thereof shall be punished by a fine not to exceed Five Hundred Dollars (\$500.00) as provided by Section 390 of the Revised Laws as amended by Act 82 of the Session Laws of 1905, and Act 112 of the Session Laws of 1907.

SECTION 4. This amendment shall take effect upon its approval by the Governor.

Approved:

(Sgd.) LUCIUS E. PINKHAM,
Governor of Hawaii.

Honolulu, Territory of Hawaii, June 30, 1914.

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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

AUGUST, 1914.

No. 8

POINTS ABOUT TIMBER FLUMES.

That the V-shaped timber flume is a more efficient type than the box or square-sided form is one of the conclusions reached by the department of agriculture in a bulletin just issued on flumes and fluming. The V-shaped wooden flume requires less water and, on the average, less repairs than the other type, is better adapted to act as a slide on steep grades, and offers fewer chances for jams. Concerning a third type, the "sectional" metal flume, semicircular in form, the prediction is made that it will come into wide use. Such a flume is strong and light, and can be quickly taken apart and transported from one place to another to be set up again.

When building flumes a good plan, says the department, is to erect a small sawmill at or near the upper end of the flume location to saw out the lumber needed for construction. Such material can be floated down the flume as fast as the latter is built and used for further extension.

For handling railroad cross-ties, cants, poles, cordwood, and the like, a flume with the sides of the V 30 inches in height is large enough. For handling logs, piling, long timber, or brailled sawed lumber, a height of from 40 to 60 inches is recommended. The best angle for the V is put at 90 degrees.

Proposed flume lines ought to be surveyed as carefully as a line for a logging railroad, to ensure evenness of grade. Grades should be kept below 15 per cent wherever possible, and the best results are obtained with grades between 2 and 10 per cent.

Abrupt curvatures in a flume should be avoided, for they are likely to cause jams. Curves should rarely be permitted to exceed 20 degrees. It may be necessary to blast out rocks and boulders, or projecting points of bluffs, or to trestle, or even tunnel, to eliminate abrupt curves or maintain an even grade.

Telephones are recommended as adjuncts to the operation of a flume. By their use a serious break or jam can be reported immediately to the head of the flume to prevent further shipment of material. A telephone also makes it possible to notify the men at the upper end of the flume just what material to ship and when to ship it.

A flume recently built on Rochat Creek, near St. Joe, Idaho, is cited as a good example of modern V-shaped flume construction. This flume, which is unusually large and built to handle heavy logs and long timbers, is said to have cost approximately \$8000 per mile for the five miles of its length, including the cost of constructing a wagon road and telephone equipment. Other flumes are cited costing from \$2000 to \$7500 a mile.

Dr. Norgaard's report for June contains matter that should be worth a great deal of money to intelligent hog raisers. It is a feature of this number of the Forester which has permanent value.

Accomplishment is of infinitely more value than agitation. What the Territorial veterinarian shows, in his May report delayed in publication here until now, regarding the check that has been given to tuberculosis among children in the municipality of Honolulu through the outlawing of diseased milk, forms a telling example of the value of decisive measures in fighting the plagues of humanity.

Dr. Norgaard should have all the backing he requires, from both the authorities and public-spirited citizens, in his campaign against filthy dairies and dirty milk therefrom.

Mr. Hosmer's review of his service in the Division of Forestry, reprinted in this number from a local daily, will interest friends of forestry abroad as well as here.

MR. HOSMER REVIEWS HIS WORK IN HAWAII.

Before leaving Honolulu to take up his new position, that of head of the Forestry School of Cornell University, Mr. Ralph S. Hosmer by request furnished the Honolulu Star-Bulletin with the following review of his work as Superintendent of Forestry of the Territory of Hawaii:

"During the past ten years the division of forestry has stood consistently for two main objects—(1) the protection and proper administration of the native Hawaiian forest on the important watersheds, and (2) the planting of economically valuable trees on non-agricultural and other waste land.

IMPORTANT ACHIEVEMENTS.

"The more important achievements of the division may be summed up as follows:

"The creation of a forest reserve system and the laying of the foundation for a proper administration of the forest reserves.

"A decrease of trespass on the forests by the extension of forest boundary fences, the eradication of wild cattle and goats in most of the reserves, and the awakening of public opinion as to the importance of these measures.

"The securing of general assent to the doctrine of tree planting on waste land, as evidenced by the establishment of many groves of trees and forest plantations throughout the Territory.

"An increase in popular knowledge and appreciation of certain valuable trees, and the keeping up of the agitation of the subject of the importance of systematic investigations with new trees and shrubs.

"The carrying on of a campaign of education as to the value and necessity of practicing forestry in these Islands, and further as to the intimate relation which the right use of the natural resources—popularly known as 'Conservation'—bears to the continued economic well-being of this Territory.

"The enactment of a forest fire law and the organization of a forest fire service.

"And some share in the strengthening of the general public sentiment in favor of forestry and forest work that has found expression in continued and increased support by the legislature.

PROTECTION OF FORESTS.

"The protection of the areas of native Hawaiian forest covering the important watersheds throughout the Territory has been sought through the creation of forest reserves. The essential object is to equalize and maintain the flow in the streams that feed the various ditch systems which make the water available for irrigation, power development, cane fluming and domestic supply. There are now 37 forest reserves owned in Hawaii. These reserves include both government and privately-owned land. The total area is 798,214 acres, of which 546,222 acres (68 per cent) belongs to the Territory. Twenty-eight of the reserves are essentially protection forests, primarily of value for safeguarding the cover of vegetation on watersheds. The other nine, almost all government land, were set apart that the areas included within their limits might eventually be brought under forest, or that the commercially valuable timber on them might be administered under the board of agriculture and forestry.

SYSTEM NEARLY COMPLETED.

"Technically, the Hawaiian forest reserve system has now been pretty nearly completed. Only a few comparatively small lands remain to be set apart to round out the forest area needed for the protection of the important streams. What has so far been accomplished is essential as the first step in the program, but to

secure the full benefits to be derived from the protection of the forest it must be followed up by systematic administration of the reserves, such as can only be secured by a forest ranger service. The immediate forest problem in Hawaii and the next step in the progress of forestry in this Territory is to get an effective field organization established and in working order.

"In large measure the boundaries of the forest reserves either consist of natural barriers or are fenced. Some of the fences are maintained under the requirements of government leases, some have been built and are maintained at government expense, and some are kept up voluntarily by corporations or private owners. The more important corners of a number of the forest reserves have been marked with metal monuments. All the forest reserve boundaries ought to be so defined.

"During the past two years the government has constructed a number of new fences. Several other stretches of fence required under leases have also recently been completed, and some other lines of forest fence have been erected at private cost. The general attitude of the public in regard to the protection of the forest has undergone a marked change in the past decade. While there is still more or less trespass going on on each island, the best sentiment is now strongly against it, rather than being hostile or indifferent as was the case previously.

"In a few of the reserves the forest is still being damaged by wild cattle and by goats, but in the last few years a very marked improvement has been effected on each of the larger islands in controlling this form of injury.

TREE PLANTING ENCOURAGED.

"The second main line of endeavor pursued by the division of forestry since 1904 has been the encouragement of tree planting. This the department has sought to do by supplying technical advice to all who desired it as to methods and means of nursery and tree-planting work, but furnishing free or at cost price tree seedlings of various species, and by a general campaign of education as to the desirability of establishing blocks of planted forest from the standpoints of commercial return, watershed protection or aesthetic considerations.

"Tree planting has been practiced in Hawaii both by the government and by private individuals and corporations for 30 years or more, but in the past few years there has been a marked increase in the number of trees set out and a much better understanding of the necessity for such work than at any time before. The doctrine of using for tree planting non-agricultural land on the sugar plantations that otherwise would be classed as waste area has been persistently preached, until it is now generally ac-

knowledgeed to be a sound policy to follow wherever it is possible to secure funds to defray the initial cost.

"In this campaign much has been written and printed, in regular reports, in the Hawaiian Forester and Agriculturist and elsewhere, both as argument and exhortation, and also in the way of concrete examples showing the profit to be derived from tree planting in terms of compound interest. Among this matter the bulletin entitled 'Eucalyptus Culture in Hawaii,' by Mr. L. Margolin, calls for special mention. This report gives the result of a coöperative study made by the Division of Forestry and the U. S. Forest Service in 1910. That the efforts put forth have really told is evidenced by the increase in the number of trees planted each year. In 1912, the last year for which full records are at hand, the number planted was well over a million and a quarter trees. For the credit of creating this sustained interest, the division of forestry has the right to claim a share.

PRAISE FOR DAVID HAUGHS.

"In this connection it is only fair to make mention of the part played by the forest nurseryman of the division of forestry, Mr. David Haughs, who has charge of the section of the division's work dealing with the growing and distribution of trees. From his long experience in the Islands, Mr. Haughs' suggestions on all matters relating to tree-growing are distinctly worth having. That this fact is appreciated is proved by the steady stream of applications for advice that come to the division. Giving assistance of this sort is one of the important functions of this office. It is an essential part of the Territory's forest work.

"The introduction and experimental planting of trees new to the Islands is a branch of forest work which it has been the aim of the division of forestry to foster, ever since its organization. Only by the actual trial of new trees and shrubs can it be known surely whether or not they will succeed here under our local conditions. The division of forestry has helped to make better and more widely known several species that had previously been introduced, especially Japanese cedar, certain of the eucalyptus, and a basket willow from the Azores. It has as well developed the use of ironwoods as a windbreak for canefields near the ocean, and has started upon the investigation of many new trees about which it is yet too soon to have positive information to give out.

"The forest fire law in Hawaii dates from 1905. Under its terms a forest fire service consisting of volunteer district fire wardens has been organized and kept strictly up to date. This skeleton organization has been effective in combatting all fires that have occurred and furthermore has gone a long way toward firmly fixing in the minds of the people generally that the Board of Agriculture and Forestry means business in its enforcement of

the terms of the forest fire law. A number of convictions have been secured, especially during the past three or four years, where fires had been allowed to escape through preventable carelessness. This action has had a salutary effect in certain sections of the Territory where the danger from fire was high.

"Very fortunately, Hawaii has suffered but little from forest fires. But in the leeward districts and in occasional dry years even in those normally subject to heavy rainfall, the danger of fire is always present. The time to make ready for fighting fire is before it starts. Hawaii is prepared.

RECOMMENDATIONS.

"Just how soon it will be possible to establish a regular service of forest rangers, paid by and responsible solely to the Board of Agriculture and Forestry, is a question of financial policy. But until such a force of efficient men is organized to patrol the reserves, prevent trespass, see that the fences are maintained, exterminate the remaining wild stock in the forests, and prevent forest fires, the Hawaiian forest reserve system will not be properly administered. This is now the first need in forestry in Hawaii.

"Next, the Territory is a long way yet from having enough groves and plantations of trees of economically valuable species. This is equally true of government and of privately-owned land. Fuel supply in certain districts, fence posts, railroad ties, bridge timbers and other lumber for rough work, to say nothing of construction timber, will always be required in Hawaii. With the diminishing wood supply on the mainland, the price of lumber will certainly not recede. It may make considerable advances. It has been demonstrated that there are trees well adapted to local conditions that can supply at least part of the local demand. It needs no argument to show the wisdom of establishing plantations of such species on land that cannot profitably be used for agriculture.

FOREST FIRE SERVICE ESSENTIAL.

"Along with the other forms of forest protection it is essential that the Territory keep up an efficient forest fire service. It will continue the duty of the division of forestry to see that the present forest fire organization is maintained, and when necessary expanded.

"There are, as well, many lines of forest investigation which it should be the policy of the Board of Agriculture and Forestry to encourage. The introduction of species of trees new to the Islands, the experimental planting of temperate zone trees on the high mountains, and enough publicity and educational work so

that the public shall be kept fully informed as to the necessity for forestry in the Islands and its needs, are all matters that should have attention.

"The practice of forestry must always continue to be one of the important functions of the Territorial government. On the foundation that has been laid in the past decade, may the division of forestry built strongly and well."

DIVISION OF ANIMAL INDUSTRY.

Honolulu, May 31, 1914.

The Honorable Board of Commissioners of Agriculture and Forestry.

Gentlemen :—I beg to submit herewith a report on the work of the division of animal industry for the month of May, 1914.

The routine work of the division, covering the inspection of imported live stock and the testing, inspection, tagging, branding and destruction of dairy animals for the eradication of bovine tuberculosis is appended in the itemized reports of the assistant territorial veterinarian.

I only wish to add that the new method of testing with tuberculin has continued to give excellent results, and that there can be no doubt that this method will be adopted the world over as soon as it has been demonstrated and officially accepted. This statement is based upon the fact that I was the first official delegated by the U. S. Department of Agriculture in 1891 to test tuberculous herds with a view to eradicating the disease, and have since that time studied and practiced all developments along this line as well as investigated all new methods and propositions pertaining thereto. I do therefore believe that, when I say that our present method, as employed only here and as developed here, will prove the one most feasible and most economic, I am entitled to sufficient confidence to warrant that the method be given a thorough test wherever the question of the eradication of bovine tuberculosis may present itself.

This statement is made with a view to influencing the members of the board to act favorably upon my application for authorization to officially represent the board at the Tenth International Veterinary Congress which holds its quadrennial meeting at London, England, August 3 to 8 this year.

At this congress bovine tuberculosis will be the main topic to be discussed. England has just passed a law carrying with it immense appropriations for the suppression of bovine tuberculosis, and my aim would be to demonstrate before the representatives of the numerous countries which will be represented there that this disease can be controlled and suppressed without any

such appropriations, at least for reimbursement to owners of diseased animals, as has been fully demonstrated in the Territory of Hawaii. Not alone has this fact been demonstrated, but the vastly more important one—that is, that the mortality of children from tuberculosis can be greatly reduced by elimination of milk from tuberculous cows from the public market—has likewise been proved, by official figures computed independently of this office, viz., the statistics of the Territorial Board of Health and the Anti-Tuberculosis League. That a majority of the States in the United States, as well as most foreign countries, should still adhere to the cumbersome and expensive old subcutaneous tuberculin test is in itself remarkable, but that the entire principle upon which the ultimate eradication of bovine tuberculosis must be based—that is, that the consumer must pay for the clean milk he demands—should entirely escape the observation of the legislators, is more astounding. It has been proved here that the consumer is perfectly willing to pay one cent per quart more for milk guaranteed free from tubercular infection, and it has also been demonstrated that this small sum is sufficient to reimburse the milk producer, as a whole, for all losses sustained on account of condemned cattle destroyed.

All that is required is education, to make the consumer demand clean milk, and demonstrate to him that through clean milk he will save a far greater amount than the increased cost of the milk through reduced or eliminated doctors' bills, medicine bills, undertakers' bills and in the general satisfaction of seeing healthy children and persons around him. Consequently, the large appropriations for reimbursements, which are now the principal stumbling blocks upon which most sanitary measures for the purpose are wrecked, will no longer be required.

Our present method of testing appears to us to be infallible, and has so far been sustained by every post-mortem examination made. While unknown up to the present in either the States or Europe, it is so simple that any practitioner may stumble over it at any time and assume the credit which should be due this board.

The same applies to the intradermal mallein test for glanders. The United States Bureau of Animal Industry has just promulgated a new regulation, changing from the old subcutaneous test to what is known as the ophthalmic test. While the latter is simpler, under favorable circumstances, than the old one, it is, according to our observations here, applicable only in 50 per cent of all cases, in summertime at least. On the other hand, we have developed here an entirely new test, along the same lines as the intradermal tuberculin test, and which seems also to be infallible. Its only drawback would appear to be that it is too searching, that even the slightest, apparently cured old nodule, in the lunge, for instance, causes a reaction. But surely no case of glanders can possibly escape it, and the reaction begins almost immediately

after injection, so that in most positive cases it is possible to come to a conclusion within two to four hours after injection. At the same time, the method is so simple that even a stable boy can interpret the results, if he has once seen it applied, or if it has only been explained to him. This test consists in the injection into the hide on the side of the neck of two to three drops of the official Bureau of Animal Industry mallein. The injection leaves a small, well-defined swelling, the size of a pea, which soon begins to enlarge, so that, within an hour or two, it has reached the size of a nickel or, in positive cases, a quarter. If the disease, glanders, is not present in the system the swelling will from then on remain stationary, or only enlarge very little more during the next twenty-four hours, remaining cold and not sensitive to touch. But if the disease is present the swelling will continue steadily to enlarge, sometimes at the rate of half an inch in diameter per hour, and at the same time becoming hot and extremely sensitive to touch. After ten to twelve hours the swelling may be six to ten inches in diameter and raised from one to three inches above the surrounding tissues, with sharply-defined margins. It is easily seen that such a reaction is vastly more diagnostic than one which, like the new official eye test, depends upon the quantity of tears discharged from the injected eye, especially when both eyes are already inflamed and running as a result of a cold, shipping fever, influenza, strangles, or simply irritation by strong sunlight or flies.

That our intradermal mallein test would be adopted, were it presented before the congress in question, there can be no doubt, the results obtained at the last outbreak of the disease in this Territory—the Waipio Valley outbreak—having demonstrated its value in 36 cases. In at least twenty of these cases the ophthalmic test could not have been used on account of sore eyes. However, both of these new methods of testing have been reported to the board in many previous communications, and the present statement was written only with a view to emphasize the importance of bringing them before the public in an effective manner. For this reason also has no publication been made in any veterinary or scientific magazine or periodical up to this date.

In regard to the interrogation from the Board of Supervisors, through Dr. Wayson, as to the statement made by me in my last report to the effect that the local milk inspection "is a farce," I have been requested not to publish my reasons for this statement, but allow the city and county physician to look into the matter, on the basis of such information as I might provide him with on the subject. I would therefore respectfully request that, for the sake of future coöperation, I be allowed to deal directly with the city and county physician on this subject in order to assist him in straightening up the situation, which without doubt requires both disciplinary and corrective measures. The very fact that infan-

tile tuberculosis has diminished to such an extraordinary extent in the only district where tuberculous milk has been barred from access to the nursery and dining-room should be an incentive to see to it that this beneficial result is not offset by a high infantile mortality from the many summer complaints among the babies and children due to filthy milk.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT FOR JUNE.

Honolulu, June 30, 1914.

The Honorable the Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the division of animal industry for the month of June, 1914, as follows:

A number of complaints of disease among hogs continue to reach this office, and during the past month examinations have been made in a number of herds in Honolulu and vicinity. Of these may be mentioned Frank Andrade's and Charles Bellina's, both in Kuliouou; Kawahara's, in Waikakalua Gulch; a single case at the Girls' Industrial School, Moiliili; in all of which places post-mortems have been made, while at a number of other places the hogs are simply not doing well, while some small pigs are lost off and on.

In only one of these cases, the one at the Girls' Industrial School, were actual symptoms of hog cholera found on post-mortem, and as this was the only hog on the place or in the neighborhood the matter ended there with the disinfection of the premises. In none of the other cases that have come under observation, nor in any reported by practicing veterinarians, has it been possible to reach a definite conclusion as to the exact nature of the disease except faulty feeding, either too much swill, uncooked swill, too little green feed, too much rice bean or not sufficient quantities of nourishing food. There seems to be an idea among the hog raisers in Honolulu and vicinity that hogs can be raised on anything that may happen to be around and that it is waste of money to purchase feed for hogs. This idea undoubtedly originates with the swill-fed hog, which, under favorable circumstances, can be grown at very slight expense in comparison with the returns, and, while the careful and experienced hog raisers can produce pork by means of swill very cheaply, his success has led a number of absolutely inexperienced and ignorant Orientals to put everything they have into a small "hog ranch" and a swill wagon

and then think their fortunes are made. Swill—that is, the refuse and offal from kitchens of private houses, hotels, restaurants or military camps—is first-class feed for hogs when properly sorted or carefully collected, but failure to attend to this will always prove disastrous, especially in a hot climate. Furthermore, unless fed the same day it is produced, or at latest the following day, the swill should always be boiled or heated to the boiling point, during which process chopped green feed such as honohono or panicum grass should be added in equal quantities with the swill, or if this is very rich, that is, containing many meat scraps, the quantity of green stuff should be as two to one. A small amount of rice bran may be added, but to use this product as an exclusive feed or as the principal component of a daily ration has in my experience always given extremely unsatisfactory results. This is undoubtedly due to the high percentage of silicates (mineral matter) and the low actual feeding value.

As swill always contains a considerable amount of metal, especially solder and frequently the tin cans as well, and as fermenting swill soon begins to disintegrate the metal, producing various poisonous salts, there is always the danger of serious alimentary disturbances when swill is fed in large quantities from this cause alone, and regardless of the danger of ptomaine poisoning. This is fully borne out by both symptoms and post-mortem lesions, exhibited in a majority of all fatal cases of disease among swill-fed hogs. Constipation is more frequent than diarrhoea, while paralysis, muscular trembling and blindness all indicate lead poisoning. On post-mortem gastro-enteritis is the principal symptom, extensive hemorrhagic areas along the large and small intestines with numerous small patches on the mucous membrane, but no button-like ulcers, as seen in hog cholera. The liver and kidneys are pale and shrunken, and without the small blood spots characteristic of hog cholera. Nor is the spleen enlarged. There are, however, many variations in both symptoms and lesions depending upon the different poisons which may develop in swill. It will therefore be seen that swill is an extremely risky food for hogs, and still there are several large hog ranches on this island, especially in the neighborhood of the large military establishments, that are simply coining money by means of swill-fed hogs. But all of them have lost large numbers of hogs before they learned how to use it judiciously, and especially learned not to over-feed and to take all of the precautions already mentioned. Besides these it is imperative to ascertain that no lye or soap-powder or any other chemical preparation used in cleaning dishes and pans reaches the swill barrel, especially if the tin cans reach it also. Next is the prompt collecting of the swill, as early in the morning as possible, and the sorting of it immediately when the pens are reached in order to remove all lemons, oranges or other acid fruit, as well as all

metal cans, colored labels and other injurious ingredients. Then the swill is placed in the clean heating tanks with the requisite amount of chopped green stuff and whatever other feed may be raised on the place for the animals. To this should be added a small amount of salt, charcoal, sulphur, antimony, etc., as recommended as a preventive for hog cholera by the federal Bureau of Animal Industry, as follows:

Wood charcoal	1 lb.
Sulphur	1 lb.
Sodium chloride (salt).....	2 lb.
Sodium bicarbonate	2 lb.
Sodium hyposulphite	2 lb.
Sodium sulphate	1 lb.
Antimony sulphid or black antimony.....	1 lb.

These ingredients should be powdered by passing through a coffee mill or in a large mortar, thoroughly mixed, and of the mixture a heaping tablespoonful should be added to the feed for every 200 pounds of hog in each pen. This prescription is repeated here because good results have been seen wherever it has been used, provided all the other precautions have been taken. But the medicine alone will not do it.

The fact remains, however, that hog cholera still exists on this island, and, even though there is not much of it or else that the hogs here have nearly all become immune, it cannot be advised to remove the restrictions against the shipping of hogs from this island to the others, for some time to come. Nor is there sufficient hog cholera to warrant the recommendation of serum immunization on a large scale so long as the price of serum remains anywhere as high as at present.

That the vigilance against the further introduction of virulent hog cholera from the Coast is still being guarded against will be seen from the appended letter from the federal live stock inspector in San Francisco, and which is self-explanatory. The fact should always be borne in mind that the virulence of the hog cholera microbe, like that of many other infectious and contagious diseases, varies so greatly in different localities that even if appearances justify the conclusion that a large percentage of the hogs here are immune to the infection *as it exists here*, there is no telling what degree of virulence they would be able to resist should a severe strain of infection accidentally be introduced. It is therefore reassuring to see the care with which our regulations are being enforced by the federal inspectors on the Coast, as testified to by Dr. Hicks' letter.

During the past month a hitherto unobserved and seemingly very serious condition was observed among the slaughtered cattle at the Hawaii Meat Company's slaughterhouse in Kalihi. The

condition consisted in a more or less pronounced oedematous (watery) swelling of the fatty tissue surrounding the kidneys, the lobes and lobules of fat being interspersed with sacks of crystal-clear fluid varying in size from a pea to a hen's egg or even larger. The kidneys themselves were somewhat enlarged, extremely pale, looking as if boiled. On section this condition appeared in the worst cases to extend throughout the entire organ, but were in others confined to the cortical substance only. The capsule was in all cases firmly attached to the organ, and no fluid was ever observed between them. The condition must therefore be diagnosed as acute nephritis and perinephritic oedema. No smell of urine could be detected even when considerable quantities of the fluid was collected and kept for one to three days, nor were any other lesions to be found anywhere else in the affected carcasses. These were, on the other hand, all in the best possible condition and were, in fact, the fattest prime steers ever seen here, and this very fact proved to be the solution of the problem. It should only be added that outside of the usual shipping soreness and stiffness, the animals in question showed no ante-mortem symptoms of any kind, but looked bright and ate well.

Acute nephritis, when not due to the presence of a specific infectious disease, such as anthrax, tuberculosis or hemorrhage septicemia, is generally caused by irritation of the kidneys in their effort to eliminate from the body toxic principles, whether generated in the body itself or introduced with poisonous plants, fermented food, young shoots of trees containing resin or tannin, but may be due to too highly nutritious food, rich in protein, such as cowpeas, vetches, clovers and other legumes. Cold also seems to be an important factor, especially cold driving rains, which are bound to accelerate the tendency to the development of nephritis if any of the previously mentioned irritating factors are present. In order to come to a definite conclusion a visit was made to the district where the cattle in question were shipped from. Especial attention was given to the fattening paddock out of which these animals had been selected, but, as already stated, none seemed to be otherwise but in perfect health and rolling fat. There had, however, been unusually heavy rainfall all through the spring months, with the result that feed was more than abundant, allowing the cattle to gorge themselves without moving any distance in search of food and, as it rained every day, they did not even have to go to the watering troughs, but simply ate water. The pasture in question was very rich in legumes, especially the sweet yellow clover and a variety of highly nutritious imported grasses.

This condition was exactly what was expected and accounted, in connection with the cold driving rains, fully for the affected kidneys as observed on the killing floor. The animals were simply so loaded up with the rich albuminous feed that their kid-

neys were overworked, the other means of excretion as promoted by exercise being excluded by the great abundance of feed.

The remedy was therefore simple enough—to remove the animals from the rich pasture for a week or so before shipping them to market, and to herd the remaining ones away from the richest parts of the pasture and let them work their way back for the sake of exercise.

It should be mentioned that the legumes only seem to have this irritating effect on the kidneys when only half or three-quarters ripe. As soon as they are fully ripe they no longer affect the animals, besides which they are less succulent and therefore less liable to cause gorging. Since the above recommendations were carried out no cases have been observed on the killing floor.

Bovine Tuberculosis Control.

As reports have reached this office about actually filthy milk—that is, milk with dirt in visible quantities on the bottom of the containers—it has been decided to make a thorough investigation of each individual dairy in the entire district and to prepare a report on the same.

At the same time a bacterial count is being made of samples of milk obtained from dairies in unsatisfactory sanitary condition, with a view to, if possible, submitting all the dairies to this most searching test.

The report of the assistant territorial veterinarian herewith appended shows the further progress in the elimination of the tuberculous cow from the local dairy herds, but, as he states, the time will soon arrive when more vigorous steps will have to be taken in order to make a complete clean-up, without which the disease will never be suppressed.

Respectfully submitted,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, June 30, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I have the honor to report as follows for the month of June, 1914:

Tuberculosis Control.

The following dairy stock have been tested during the past month:

	T.	P.	C.
F. Fugita	2	2	0
K. Shimidsu	1	1	0
T. Katsuko	5	5	0
F. de Mello	6	6	0
K. Okomoto	4	4	0
Ewa Boarding House	1	1	0
C. A. Vasconcellas	5	5	0
S. Mendonca	2	2	0
H. Dias	1	1	0
A. Ornellas	1	1	0
J. T. Ornellas.....	1	1	0
F. A. Ornellas.....	1	1	0
F. Dado	17	17	0
M. K. Young.....	1	1	0
W. E. Wall.....	17	16	1
A. W. Seabury.....	1	0	1
George Holt	29	25	4
A. F. Cooke.....	8	8	0
Kamehameha Schools	1	1	0

From the above tabulated list it will be seen that 104 head of dairy stock received injections of tuberculin, out of which number 98 passed and six were condemned and branded.

It is interesting to note that W. E. Wall's imported Holstein cow gave a reaction to this last test, this being the first time it has shown a reaction since it was condemned June 21, 1913, nearly a year ago, during which time she received three intradermal injections with apparently no result. On the first test, June 21, 1913, the sub-caudal fold was injected intradermally and the resulting swelling was clearly defined and typical of reactions in that part of the body. The day before I make my examination there had been a marked constitutional reaction which was observed by the owner. Since this time sub-caudal injections have been made at regular intervals with no results.

On the 10th of the month this cow was again subjected to the intradermal test, but after the improved method, i. e., injection into the skin of the lower eyelid, and this time she gave a distinct reaction. From the size and appearance of the swelling, which was smaller than the first reaction, our experience leads us to conclude that the disease had advanced to some degree and may even be generalized. The physical appearance of the animal, which has lost considerably in flesh, would seem to bear out such a supposition.

The cow condemned for A. W. Seabury was one of the Rose Davison dairy stock and the size and appearance of the reaction, together with the physical condition of the animal, would indicate that the disease is pretty well generalized.

George Holt's dairy has again shown a number of diseased animals. Only two months ago nine cows were condemned and branded out of a total of 27 head. This brings the total number of recently condemned animals from this dairy up to 13 head, all of which have been sent to Mr. Holt's ranch at Maili, where they can wander unrestrained and spread the infection all over the district. On a recent trip past Maili, three of these condemned animals were noticed grazing along the road. It would seem that the time is now at hand when this division should be given absolute authority and control over all condemned animals in order that they may be disposed of at once through the different slaughter-houses and not allowed to disseminate the disease throughout the island. It is our opinion that without such authority, control and eventual eradication of bovine tuberculosis within this Territory is practically impossible.

Importations of Live Stock.

June 1—S. S. Sierra, San Francisco: 17 crates poultry.

June 2—S. S. Lurline, San Francisco: 21 crates poultry; 2 dogs, Mrs. Kirkaldy; 4 crates poultry, Kahului, Maui.

June 9—S. S. Wilhelmina, San Francisco: 23 crates poultry; 1 dog, M. P. Morgan.

June 15—S. S. Ventura, San Francisco: 14 crates poultry.

June 16—S. S. Manoa, San Francisco: 35 crates poultry; 2 crates poultry, F. F. Baldwin, Kahului, Maui.

June 17—S. S. Georgian, Seattle: 205 butcher hogs, 28 hogs (breeding), 7 horses, 14 mules, 12 cows, 1 calf, 2 bulls, A. L. Macpherson.

June 23—S. S. Matsonia, San Francisco: 18 crates poultry, 1 crate swans, 1 crate pheasants, A. Robinson; 1 crate monkeys, W. F. X. Company; 1 monkey, Geo. Ahlborn.

June 23—S. S. Honolulan, Seattle: 1 Jersey bull (pure-bred), 1 Durham bull (pure-bred), S. M. Damon; 10 mules, 1 grade Durham bull, Schuman Carriage Company.

June 29—S. S. Manchuria, Orient: 1 dog, H. A. Hiscox.

June 20—S. S. Sierra, San Francisco: 3 crates poultry.

June 30—S. S. Lurline, San Francisco: 24 crates poultry

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, June 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen: I respectfully submit my report of the work performed by the division of entomology for the month of June, 1914, as follows:

During the month 35 vessels arrived at the port of Honolulu, of which 24 carried vegetable matter and one vessel molding sand.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1308	20,071
Fumigated	1	1
Burned	48	48
Returned	1	1
Total inspected	1358	20,121

Of these shipments, 19,892 packages arrived as freight, 112 packages as baggage of passengers and immigrants, and 117 packages by the U. S. mail.

RICE AND BEAN SHIPMENTS.

During the month 34,981 bags of rice and 3521 bags of beans arrived from Japan which were allowed to land after thorough inspection.

PESTS INTERCEPTED.

Twenty-nine packages of fruit and 15 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which, being prohibited, were destroyed. One hundred and six boxes of apples from the Pacific Coast had to be overhauled on account of having been packed in moth-infested boxes, the fruit not showing any infestation. One box of plants from California was found infested with the common greenhouse whitefly and the plants were fumigated before delivery.

One package of plants arriving from Manila without a permit from the Federal Horticultural Board was returned to the shipper.

During the month two packages of medicinal worms arrived, one by parcel post, in which the worms were very much alive; in fact, one moth had almost emerged from the pupa. This shipment was identical with the one destroyed in the month of February, but no instructions accompanied the sending. The other package consisted of a tube made out of a joint of bamboo, sawed

into at one end, making a perfect mailing tube, and found in the baggage of a Japanese at the immigrant station. It contained 12 large lepidopterous larvae which we found had been baked; however, we confiscated the lot so as to discourage the worm-eating habit for the cure of consumption, thereby lessening future importations if possible.

BENEFICIAL INSECTS.

Dr. Silvestri sent six tin tubes containing dungfly material, but unfortunately the shipment arrived in very bad condition, all beetles being dead. Mr. Muir sent a box of soil containing larvae and pupae of the Japanese rose beetle, supposed to be parasitized. This box was examined at the Planters' station with Mr. Swezey present and, after removing all the larvae and pupae, the soil was fumigated and destroyed by burning.

The breeding and distribution of the various parasites from Silvestri has continued during the month. Owing to Mr. Bridwell's trip to Africa, this work now falls to me with one assistant. Our endeavor is to keep the parasites breeding until such time as we are positive that their establishment is a certainty. We have liberated 11,190 parasites during the month, and we are devoting our efforts especially to the distribution of the *Opius humilis*, which appears now to be the most promising. We have been able to rear this parasite from guavas and other fruits collected in the vicinity where the species was liberated a month or so ago. We have also been breeding the two Philippine parasites for hornfly and housefly which Mr. Fullaway brought with him on his return from the Philippines. About 1000 of each species have been liberated during the month.

HILO INSPECTION.

Brother M. Newell reports the arrival of nine steamers at the port of Hilo, six of which brought vegetable matter consisting of 142 lots and 2787 packages; all being free from pests, they were passed. On account of the usual ten days' retreat for Brother Newell, I sent Mr. D. B. Kuhns to Hilo to look after the work during that time.

INTER-ISLAND INSPECTION.

During the month of June 62 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	96 packages
Taro	660 bags
Fruit	28 packages
Vegetables	14 "
Awa root	2 "

Total passed 800

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to plants:

Plants	7 packages
Fruit	6 "
Vegetables	2 "

Total refused 15 "

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, June 30, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the routine report of the division of forestry for June, 1914:

FOREST RESERVE FENCING.

During the early part of the month, as one result of my visit to Kona in May, definite arrangements were completed with Messrs. F. R. Greenwell and John A. Maguire for the fencing of the Waiaha Spring forest reserve boundary in North Kona, and part of the material for doing the work forwarded. Arrangements were also consummated for the building of a forest fence on the land of Wailupe in Palolo Valley, Oahu, that will protect the forested ridge between Palolo and Manoa valleys.

Satisfactory reports have come in that progress is being made on the other forest reserve fences now under way.

FOREST LAND TRANSFER.

Under the date of June 13, 1914, a formal agreement was signed by the Governor and the Commissioner of Public Lands,

acting for the Territory, and by the Honorable George R. Carter, whereby the latter transfers to the Board of Agriculture and Forestry for a period of five years a tract of 132 acres of forest land, on the slopes of the mountain at the head of Manoa Valley, Honolulu, for forest purposes. The land forms a part of the Honolulu Watershed forest reserve. The object of turning the custody and control of it over to the government is that, along with the government land at the head of Manoa Valley, it may be cared for by the Territorial division of forestry in accordance with the principles of practical forestry. Under Chapter 28 of the Revised Laws of Hawaii the government may accept such transfers of lands, under conditions to be fixed by the board. As long as an area of forest remains exclusively in the control of the government, it is, upon demand, exempted from taxation. The amount of the taxes remitted on this Manoa land is not great, Mr. Carter's idea being rather to signify in a public manner his willingness to cooperate with the Board of Agriculture and Forestry and his belief in its forest work.

One other similar transfer has already been made in Hawaii. This was in November, 1906, when certain lands in the Koolau district on Maui, leased and owned by the Alexander & Baldwin interests, were turned over to the government for a term of seventeen years. The action of ex-Governor Carter in regard to his Manoa Valley land is of especial importance, as it helps to confirm and establish a precedent. In later years, when the Territorial government is equipped with an administrative force adequate to the task of properly caring for its forest reserves, the present transfer may be of assistance in helping to bring other owners of private forest lands into line.

ISSUE OF PERMITS.

At the end of June several permits, good for a period of three months, were renewed to persons temporarily occupying portions of the tract named Kalawahine, in the Honolulu Watershed forest reserve. In return for this privilege the licensees pay a fee to the government and agree to turn out to fight forest fires should any start in their neighborhood from any cause whatsoever.

TRIP TO MAUI.

From the 15th to the 27th of June I was on the Island of Maui, engaged in a general inspection trip that included several districts. Landing at Hana, I first visited and inspected the forest fence built for the board on the boundary of the Hana forest reserve above Nahiku. This fence, together with the sections of it built jointly by the board and the adjoining private owners, now shuts off and protects the native forest from Puu Hinai to Maka-

pepe Gulch to the north and west of which the forest is already protected voluntarily and under government lease requirements by the East Maui Ditch Company. The fencing above Nahiku was done for the government by the Nahiku Rubber Co. under the personal supervision of its manager, Mr. W. A. Anderson. It is a satisfactory piece of work.

Next, in company with Mr. R. A. Drummond, I worked along the forest line at the south end of the Hana district and across Kipahulu and Kaupo. The object of this portion of the trip was to determine the points between which forest fences are required, and in Kaupo and Kipahulu to lay out the boundary of a forest reserve. These two districts contain the one large section of government forest land in the Territory needed for stream protection that has not yet been brought into the forest reserve system. A report recommending the establishment of the Kipahulu forest reserve will shortly be submitted to the board for its approval.

Crossing Kahikinui, I then followed and inspected the recently-repaired fences around the Polipoli Spring section of the Kula forest reserve. I am glad to report that this fence, which for a considerable time had been in bad condition, is now in excellent shape, new posts having been set and the wires restrung. The upkeep of the Polipoli fence is required by the license to use a portion of the water from Polipoli Spring, held by Dr. J. H. Raymond.

While on the mountain I also rode the newly-constructed forest fence on the boundary of the Kula forest reserve, built under the requirements of government lease held by the Cornwell Ranch. This fence is substantially built of mamane posts, five wires. It runs from the corner of the Polipoli section across the face of Mt. Haleakala to the northern boundary of the government land of Waiakoa. Mauka of the fence the land is of such character as to be judged of but small value for grazing. It was accordingly set apart as a forest reserve with the expectation that in time it could be made to grow conifers and other temperate zone trees. It is to be hoped that steps to start such planting can be taken before very long.

In addition to the fence building the Cornwell Ranch is also under obligations to plant trees on the government grazing land it has under lease. The three plots so far started were visited by me and the planting examined. Eucalyptus are the trees used. The little trees are starting well, the percentage of loss in the planting being very small. Several additional plots will soon be put in to bring up to date the number of trees required to be planted.

On subsequent days I inspected the fence built for the board on the boundary of the Waihou Spring forest reserve near Olinda, under contract by the Haleakala Ranch Co.; had a look at the federal experimental tree lot No. 1, higher up Mt. Halea-

kala; visited the experimental tree-planting plots above Kailiili, Makawao, and, in company with the man now in charge there, went over the proposition of thinning out the algaroba forest on the government lands on the beach at Kihei.

The fence at Waihou is satisfactorily completed. In the mountain tree lot I found a dozen or more specimens each of three different pines and of incense cedar, firmly established and growing vigorously. Some of the pines were between 6 and 7 feet in height. In this plot are also various eucalyptus and other forest trees set out under the direction of this division during the past six years. Although meager in number, the success of these individual trees shows that it is feasible to grow such temperate zone species. Later, when it is found possible to undertake such experimental planting on Mt. Haleakala in a more systematic way, much benefit should result from it.

The experimental plantation of eucalyptus above Kailiili is in charge of Mr. W. Hannestad, under a coöperative arrangement with the Maui Agricultural Company. A considerable variety of species new to Hawaii have been planted here in the past two years, to be tried out. The results so far make this experiment a very satisfactory one.

REPORT FROM THE NURSERY.

Mr. Haughs' report for June, which as usual is transmitted herewith, gives the details of the section of the division of forestry's work dealing with tree planting and the distribution of seedlings. The item of especial interest this month is that a good stock of little trees is being got ready for the planting season, next autumn.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, June 30, 1914.

R. S. Hosmer, Esq., Superintendent of Forestry.

Dear Sir:—The following report gives the principal work done during the month of June:

Nursery.

Distribution of Plants.

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold	2,250	200	258	2,708
Gratis	13,000	3,948	1,263	18,211
	<hr/> 15,520	<hr/> 4,148	<hr/> 1,521	<hr/> 20,919

Collections.

Collections on account of plants sold amounted to.....	\$15.40
Rental of building, Nursery grounds, for month of May..	35.00
Total.....	\$50.40

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 250 in seed boxes and 1300 in transplant boxes; total, 1550.

The propagation of large numbers of trees for the coming planting season is now going on and a big stock will be on hand. This work will keep all hands busy for some time to come.

Makiki Station.

At this station the new introductions are being tested and quite a number of very promising species are now almost ready to plant out.

Honolulu Watershed Planting.

The two men employed to hoe and care for the trees recently planted on Sugar Loaf and adjoining lands have been doing regular routine work along these lines.

Advice and Assistance.

The writer has been asked to make calls and give advice as follows:

Visits in and around the city, 6; advice asked by telephone, 8; advice asked at Nursery, 11; advice asked by letter to other islands, 4.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, Hawaii, July 11, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the division of hydrography during June, 1914, is submitted:

OAHU.

While leeward Oahu has had a comparatively dry month, the Koolau range has received more than its usual amount of rainfall, with the result that reservoirs along the leeward side of the range are well filled.

In addition to routine field work, the construction work in connection with the coöperative stream-gaging stations was well advanced. One clock register stream-gaging station on the lower south fork of the Kaukonahua and one relock register ditch-gaging station for the U. S. Army were completed, and two of the three clock register stream-gaging coöperative stations for the Kahuku Plantation Company on the main and middle branches of the Malaekahana stream were finished. It is expected that the remaining three coöperative stations for the Kahuku Plantation Co. and the Laie Plantation Co. will be completed during July.

KAUAI.

June was an unusually wet month, and the island generally received an abnormal amount of rainfall. On June 22 heavy rainfall was general all over the island, and the Wainiha river was reported by Mr. Menefoglio as the highest he had ever seen it.

A minimum amount of routine gaging work was done on account of the heavy construction work being accomplished. The Waioli stream (government water) clock register measurement station at an elevation of 750 feet above sea level was completed. This station necessitated the construction of a three-mile trail, which required the labor of four laborers and one foreman for a period of 22 days.

During July a clock register stream-measurement station will be constructed on the Wainiha river above the power line ditch intake, at an elevation of about 750 feet above the sea level. No trail work will be required for this station.

June 3 to 5: The superintendent made reconnaissance investigations of the Waioli and North Wailua valleys, and definite locations were selected for station sites.

MAUI.

Wet weather conditions continued during June, but there was less rainfall than during the previous month.

Twenty stream measurements were made during the month at medium or flood stages. Four new Stevens clock registers were placed at stations previously prepared to receive them.

The month was utilized almost entirely in obtaining stream measurements which improved rating curves.

HAWAII.

From June 17 to 22 an examination was made of the south branch of the Wailuku river near Hilo at the request of the Attorney General, in connection with the Hilo Boarding School ditch controversy. The results of this investigation have been reported to the Attorney General of Hawaii for his use when the case comes to trial at Hilo. Floods prevented the completion of this investigation, and a further examination will be made as soon as the Wailuku drops to a normal stage, probably during July.

EXPERIMENTAL INVESTIGATIONS.

Tentative arrangements have been made with the director of the H. S. P. A. Experimental Station to undertake an investigation of ditch losses, evaporation, water duty under different conditions of soils, etc. The work will be started at the experimental substation at Waipio near Waipahu, Oahu. The H. S. P. A. will furnish all labor, materials, etc., while this division will furnish the technical help to carry out the hydrometric work. After the work has been started at Waipio it is hoped that it can be extended to plantations on all islands under differing conditions of soil, climate, crops, etc.

The first work to be taken up will be the investigation of ditch seepage soil and distribution losses, and some evaporation experimental work which will be started during July.

It is believed that the data obtained will open the way to greater efficiency and economy in water utilization in Hawaii.

STREAM-GAGING STATIONS MAINTAINED.

Island.	May 31.	Established	Discontinued	June 30.
		During Month.	During Month.	
Kauai	27	1	0	28
Oahu	44	4*	0	48
Maui	43	2	2	43
Kona, Hawaii	1	0	0	1
Total	115	7	2	120

* Registers not yet put in.

Of the above stations, the following are clock register or continuous record stations: Kauai, 12; Oahu, 15; Maui, 20; Hawaii, 1. Total, 48.

Very respectfully,

G. K. LARRISON,
Superintendent.

*ALFALFA—A PROMISING FORAGE CROP FOR
HAWAII.*

By WILLIAM H. MEINECKE, Class of 1913.

(Concluded.)

SUMMARY.

Alfalfa is not only an excellent fodder plant, but it is very good as a rotation crop with corn and sorghum. It will grow well on almost any soil provided it is well drained and free from acids.

The usual amount of seed sown broadcast is 20 to 30 pounds per acre, but 15 pounds of prime seed should be sufficient. If drilled, less seed is needed.

Weeds are first of all the worst enemies of the young alfalfa seedlings, but by judicious methods of preparing the land, their growth can be reduced to a minimum.

Cut worms are the worst and so far the only important enemies of the Hawaiian alfalfa crop, but they may be controlled by drowning and poisoning.

Weeds and cut worms are no longer troublesome after the crop has once become well established.

The field requires little care after the first few months and will continue to produce high yields of fodder once in three to five weeks, according to the variety and season.

While the cost of production for the first year is very high, subsequent crops which continue maturing every month for several years will more than make up for it and produce large profits.

Of the varieties under test at the College of Hawaii, the Utah strain of the Chilean proved to be by far the best, with the Kansas variety a good second.

The Arabian variety did not yield as well as the others, but it matures in from 17 to 21 days, and is very succulent and tender. Where there is ample moisture and a desire for frequent harvests, this variety will prove to be very desirable, especially for feeding hogs and chickens. On the other hand, this variety is very susceptible to a fungous root rot and it is not recommended where this disease is likely to be present.

One acre should produce eight to 10 tons of green fodder per

month at a cost of \$18 to \$20 per acre (including weighing) if harvested with the sickle. The use of the machine mower and horse cultivator will aid greatly in reducing the cost of production.

Every dairy should have alfalfa and corn or sorghum fields. These crops yield heavily at low cost and make very good mixtures for the silo and feeding ration.

Cows are especially fond of alfalfa, sorghum and corn, and judicious feeding will prevent them from getting "off feed."

Alfalfa has done well in all parts of the United States and in Hawaii.

The average annual yields of the common variety in the United States is three to five tons of dry hay per acre from three to five cuttings. In California the average annual yield is five tons of hay per acre from five to seven cuttings, though 10 to 12 tons have been obtained from nine cuttings on the best alfalfa lands.

Hawaii can produce an equivalent of 10 tons of dry hay per acre during the first year and still more than that during the second. Nine months from the time of seeding the College of Hawaii experimental plot (common Utah) has produced an equivalent of 26.10 tons green or 5.22 tons of hay from six cuttings.

Our last crop of the Utah strain yielded 9.24 tons of green fodder or 1.85 tons of dry hay per acre. Taking this as a basis, and allowing for 12 cuttings, one acre should and undoubtedly will produce in one year (second year's growth) 110.88 tons of green feed, or 22.20 tons of hay. Half this yield would be profitable.

CONCLUSION.

Alfalfa is an extremely difficult and expensive crop to establish, but owing to its long life and high yields and feeding value, it is in the end very profitable.

The discouragements which accompany the establishment of the crop are very trying, but success requires only a few months of persistence and a "never-say-die" spirit on the part of the grower.

This crop, together with corn—which has yielded as high as 94 bushels of grain per acre and an average of from 70 to 80 bushels at the College of Hawaii—is worthy of attention and trial by every stock feeder in the Territory.

W. H. MEINECKE.

May 31, 1913.

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A LITTLE-KNOWN FIG-TREE.

Familiar in Egypt under the ancient name of "Sycomore," the interesting species of *Ficus* known as *F. sycomorus* has for ages been renowned for its hard-wood and for its pleasant and nutritious fruit. This fruit, which the Arabs call "fig of Pharaoh," does not possess so fine a flavor as the figs of the species *Carica*, but it is nevertheless very agreeable to the taste, sweet, leaving an after-taste resembling that of coconut. The pulp is firm and juicy.

In Egypt, the "Sycomore" is not cultivated in orchards, but it is sometimes found growing in avenues. It forms a useful shade tree near to houses and particularly for wells to provide shade for the animals that work the native chain pump.

The geographical range of this species comprises Egypt, Abyssinia and Arabia. The tree is susceptible to cold weather. Mon. Charles Henry, ex-gardener-in-chief to the Khedive, writing in *L'Agronomie Coloniale* (October 31, 1913), believes that the tree would thrive throughout the tropics, particularly in sheltered localities. Specimens already exist in the French colonies in West Africa.

The propagation of *F. sycomorus* presents no difficulties and is done by means of cuttings 40 to 50 cm. long. In three years the branches are well formed and the young trees are ready to be planted out.

The flower of this species is different to the other representatives of the genus, for a description of which the reader may refer to Mon. Henry's article.

During each year after the tree has come in bearing, the bark of the larger branches is chipped off to quicken fructification. This treatment is analogous to "ringing."

The ripening of the fruit is stimulated by caprification—that is, by boring a small hole into the fruit. Latex is exuded and the wound heals. Ripening follows three or four days after caprification.

The average harvest yield is 660 lbs. of fruit per tree.

It should be pointed out that all "Sycomores" are not of equal value. Varieties exist but have not so far been determined; though by communicating with the writer mentioned above it would be no doubt possible for those interested in this useful tree to obtain further detailed information.—Agricultural News.

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INEFFICIENT DAIRY INSPECTION.

If the municipal authorities fail in their duty to carry out the provisions of the milk ordinance which have to do with the cleanliness of dairies from which the public is supplied with milk, upon them will fall the responsibility not only of endangering the health and lives of the people—children in particular—but of preventing Honolulu from making the finest record of any municipal district in the world with respect to pure and wholesome milk supply. For, according to Dr. Nørgaard's official reports, the testing of dairy cattle for tuberculosis has been more effectively accomplished, and that without compensation from the public treasury for cattle that had to be destroyed, in the City and County of Honolulu, comprising the island of Oahu, than in any other jurisdiction of which data has come to hand.

When the milk ordinance was passed, about five years ago, Dr. Nørgaard, the Territorial veterinarian, with the sanction of the Board of Commissioners of Agriculture and Forestry, undertook to do the testing of cattle. This was to enable the dairymen to comply with the provision forbidding the sale of milk from tuberculous cows without having to pay professional fees for the service, besides being in accordance with the functions of the agricultural bureau relating to the suppression of diseases of livestock. This undertaking was begun under an arrangement between the committee on animal industry of the Board and the Board of Supervisors, whereby the latter gave money and the assistance of its sanitary inspectors to help the work. Very satisfactory results from this arrangement were achieved, as all who have followed the reports of the veterinarian know. Opponents of the milk ordinance at its inception, who insisted that without a compensation provision the measure would utterly fail, have been proved absolutely mistaken. Tuberculosis has been practically eradicated from the jurisdiction, and not one claim for compensation for hundreds of cattle destroyed has been recorded.

It is regrettable to find, in view of the achievement just mentioned, that the veterinarian is compelled to report failure with regard to the other prime object of the ordinance, that of enforcing sanitation in dairies, which is particularly in the province of the municipal government that enacted the measure. He shows in his July report, printed in this number, that the milk from

many dairies is heavily charged with dangerous bacteria. This is proof that the dairy inspection by the municipality is anything but efficient. It is a condition that the public should not stand for, endangering as it does the health and lives of young and old. The ignorance and prejudice that were hurled at the milk ordinance, before and after its first draft was vetoed by the mayor, are surely of the past since the veterinarian has published figures showing that it has tremendously reduced the number of cases and still more the number of deaths from tuberculosis among children under five years of age—cases by 66 per cent and deaths by 75 per cent, for the year ended June 30, 1913. Such a record must not be allowed to be spoiled by negligence on the part of the municipal inspectors relative to the cleanliness of dairies.

STANDARDIZATION.

With especial reference to cotton growing, the *Agricultural News* (W. I.) of August 15 devotes its leading article to "Commercial Standardization in Tropical Agriculture." The article mentions sugar as an article the valuation of which has been placed upon a scientific basis, saying that in the case of other crops, in spite of a similar need being experienced, little progress has as yet been made in the direction of standardization. The following opening paragraph of the article is worthy of attention by growers of all tropical products:

"In the production of every class of raw material that has to undergo manufacture before being sold to the consumer, it is very desirable, and indeed necessary, that scientific methods should be available for the precise determination or standardization of the so-called commercial grades. The introduction of a system having this object is particularly favorable to the interests of the producer or grower, for it assists him in forming a true judgment of the market value of consignments, and enables him to frame a definite idea of the class of material he should aim at producing. On the manufacturer's side, also, benefit accrues, from the fact that he is more likely to be supplied with the particular grade he is in need of, and this in uniform quantities."

It is gratifying to learn that the Territorial veterinarian has at last been able to enlist the county governments of the other islands than Oahu in the work of bovine tuberculosis control.

Dr. Nørgaard's zeal in guarding against the introduction of rabies to these islands will one day be appreciated. A single case of the awful malady slipping in would instantly silence all cavilling at the precautions, but in that event no doubt those who carp at the present restrictions would be first to blame the vet. for letting it happen. Such is human nature.

It is wonderful what a quantity of prohibited fruits and vegetables is attempted to be brought into these Islands every month. One should suppose that the foreign consuls would long ago have succeeded in making it generally known in their respective countries that these things are contraband except when accompanied by a Federal permit, and absolutely with respect to certain growths and certain countries of origin.

Any month's report of the division of entomology, with its record of pests intercepted, must create the conviction in the minds of all who read it that, were it not for the eternal vigilance exercised, tillage of the soil in Hawaii would be the most desperate form of human activity. It would be fighting an alliance of millions of foes.

Reports of fruit fly control by means of the parasites introduced by Dr. Silvestri from Africa seem to be more encouraging each successive month. The breeding of fresh contingents from the original distribution fields would indicate that these natural enemies of the pest have been locally established.

The report of the superintendent of forestry for July shows that the fencing of forest reserves is being done in a substantial manner. Anyone who has noticed the difference in forest growth between adjacent lands fenced and unfenced in these Islands will realize the importance of this branch of the work of the division of forestry.

Mr. Hosmer's encomiums passed upon the park creations at Kalaheo homesteads on Kauai ought to awake emulation on the part of homesteaders elsewhere.

A distribution of 13,692 tree plants to the general public in July, together with a total of 70,000 for the season to plantation and other corporations, shows that the forestation of bare spots in the islands is going ahead in magnificent style.

Superintendent Larrison's anticipation of "a large irrigation and power project which will serve leeward Kauai," as a result of the operations of the division of hydrography, will give an idea of the value of the work being done on all the islands by that branch of the bureau of agriculture. In time countless millions of gallons of water now wasting into the sea will be controlled for the purposes of agriculture, manufactures and the people's comfort. Honolulu, also, will shortly be informed of available resources now popularly unknown from which to supply its citizens with the additional water that the growth of the city will demand.

In this number will be found the proclamation of a new rule for the protection of the watersheds in Nuuanu and Makiki valleys, Honolulu.

Under the head, "Recent Progress in the Cultivation of the Sugar-Cane," the *Agricultural News* (W. I.) copies from the *International Sugar Journal* for July an abstract of the report of the committee on the cultivation and fertilization of unirrigated plantations presented at last meeting of the Hawaiian Sugar Planters' Association.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, July 31, 1914.

The Board of Commissioners of Agriculture and Forestry.
Gentlemen:—

Bovine Tuberculosis and the Local Milk Supply.

As stated in my last monthly report the tuberculin testing of the dairy cows of the City and County of Honolulu will be resumed shortly or when the required tuberculin is received from Washington. The new improved cartags have already been received, a sufficient number having been secured to allow of their application to all tested cows in the entire Territory, and it is hoped that their use, in connection with the free supply of tuberculin and such services as the deputy Territorial veterinarians may be able to render, will add greatly to the extension of this important work to many districts on the other islands, where the eradication of bovine tuberculosis is still in its incipency. With the exception of Kauai, where the disease undoubtedly gained an early foothold with imported breeding stock, it is not expected that any such percentages of diseased animals will be met with as were encountered here at the beginning of the work. But unless supported financially by either the territorial or the respective local authorities the deputies cannot undertake a systematic eradication campaign such as was done here, but must apply themselves to it as opportunity and other duties will permit. As will be seen from the appended report covering the laboratory work done during the month of July the hygienic condition of the local dairy stables has not improved at the same rate as the sanitary condition of the dairy animals. With practically all diseased animals eliminated from the herds the bacterial count has in many cases increased instead of decreased, so what has been gained by removing the actual infectious disease germs from the market milk is frequently offset by the presence of disease producing filth germs by the million. This matter, however, will be dealt with in a separate paper now being prepared and until ready for publication it is recommended that the appended list of bacterial

counts be withheld in order to give the milk producers, some of whom work under disadvantageous conditions, an opportunity to improve their methods without first driving their customers away.

The Introduction of Non-Declared Dogs on Naval Vessels.

As will be seen from the appended correspondence and clippings attempts have again been made to bring dogs from rabies infected countries into the Territory in violation of the quarantine regulations. This applies in one case only to a dog on board the U. S. transport Thomas, while the U. S. S. Rainbow, direct from the Philippines, arrived with two dogs on board in violation of a strict federal regulation. These dogs could not even be landed here in quarantine, and were therefore destroyed. The U. S. S. Alert had on board four dogs, which are now all in quarantine, which also applies to one declared dog on board the U. S. transport Dix. Both the U. S. West Virginia and North Dakota had dogs on board while here recently, one of which at least was seen ashore.

So far as the transport service is concerned this office has been assured of the future strictest compliance with the local regulations, while the question of dogs being brought here from the Philippines on U. S. vessels has been referred to the proper authorities in Washington, D. C.

Cerebro Spinal Meningitis.

This disease has again made its appearance among the horses and mules on Maui and a letter is herewith appended from Dr Fitzgerald, requesting my assistance in person. As a number of new theories as to dealing with this disease were advanced at the London International Veterinary Congress, the advance sheets of which have been received here, I would recommend that his request be complied with and that I be directed to visit Maui for the purpose of studying this disease as well as for the inauguration of a bovine tuberculosis campaign.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, July 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of July, 1914, as follows:

During the month 37 vessels arrived at the port of Honolulu, of which 20 carried vegetable matter.

<i>Disposal</i>	<i>Lots</i>	<i>Parcels</i>
Passed as free from pests.....	1016	20,590
Fumigated	13	36
Burned	33	33
Returned	4	4
Total inspected	1066	20,663

Of these shipments 20,456 packages arrived as freight, 117 packages as baggage of passengers and immigrants and 90 packages by the U. S. mail.

Rice and Bean Shipments.

During the month 22,569 bags of rice and 2,434 bags of beans arrived from Japan and 20 mats of rice from China. All of these shipments were thoroughly inspected and were found free from pests.

Pests Intercepted.

Twenty-three packages of fruit and 6 packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which being prohibited were destroyed. Four packages of soil arrived by mail from Manila and were seized and the owner notified that soil is prohibited from entry here. This soil was sent here to be analyzed but the consignee did not care to forward the same to the Coast for this purpose, so it was burnt. Four packages of plants and seeds were returned to shippers in foreign countries as being prohibited in the mails under the rules and regulations of the Federal Horticultural Board. On an azalea plant from Japan were found a few flea beetles and the plant was fumigated before delivery. On a shipment of camellia plants from Japan we found some nymphs of a *Hemipteron* crawling on the cloth covering on board the steamer. We immediately had the packages placed in the fumigating room and treated with gas. After fumigation we found all crawling insects dead, among them being some caterpillars. Four boxes of Mexican limes arrived on the S. S. Lurline and as all Mexican fruit is contraband the boxes were seized and the consignee noti-

fied. As he did not care to return them to the shipper they have been burnt. A small lot of horse beans badly infested with the bean weevil (*Bruchus pisorum*) were destroyed.

Beneficial Insects.

Mr. Muir sent a box of soil containing the larvae and pupae of the Japanese rose beetle supposed to be parasitized. I opened the box in the presence of Mr. O. H. Swezey of the H. S. P. A. Mr. Swezey removed all the insects and turned all the soil over to me and it was taken to the garbage dump and burned. Mr. Swezey reports that none of the parasites have so far hatched and he has little hope for this sending, it having been too long on the way. Mr. Swezey also received a tube containing *Diptera* pupae from Mr. Muir, but unfortunately these also arrived dead.

Six lots of Japanese beetle fungus were distributed during the month. Dr. Silvestri sent nine tin tubes containing dungfly material. Only three tubes contained live beetles, fourteen in all, which were liberated in the same locality as the other sendings. This shipment left Italy June 14, arriving here July 3. All material contained in the tubes was fumigated and burnt so as to avoid accidental introduction of any plant germs or noxious insects. Considerable time has been devoted to parasite work. During the month 7,875 parasites were distributed on Oahu and the other islands. Of this number 2,475 were *Opus humilis* for the fruit fly and 2,000 were parasites for the hornfly; the rest were liberated in vegetable gardens for the melon fly. During the month we have been able to rear the three species of dungfly parasites from material gathered in the field. We have also obtained the *Opus* from several fruits gathered in localities about Oahu and from coffee gathered at Kona, Hawaii, we have reared 90 *Opus* from 100 fruitfly pupae. The parasite was first liberated in Kona about a year ago so that the *Opus* no doubt is established in that locality.

Hilo Inspection.

Brother M. Newell reports the arrival of seven steamers and one sailing vessel at the port of Hilo, five of which brought vegetable matter consisting of 215 lots and 2,443 packages. The plants in one box of shrubs had the soil removed before delivery. The steamer Anyo Maru arrived direct from Japan and brought 5,833 bags of rice and 195 bags of beans, all of which were found free from weevils and passed.

Inter-Island Inspection.

During the month of July 60 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	75	packages
Taro	721	"
Fruit	12	"
Vegetables	18	"
<hr/>		
Total passed	826	"

The following packages were refused shipment on account of being either infested with pests or having objectionable soil attached to plants:

Plants	16	packages
Fruit	12	"
Vegetables	1	"
<hr/>		
Total refused	29	"

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomok

DIVISION OF FORESTRY.

Honolulu, July 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit the routine report of the Division of Forestry for July, 1914, and as usual to transmit herewith that of the forest nurseryman.

Forest Reserve Fences.

Another forest reserve project was got under way this month, the building of fences on either side of the government trail leading up to the Kolekole Pass in the Waianae hills, across the Lualualei forest reserve, Oahu. The contract was signed on July 15, with Mr. J. K. Luka of Waianae. Work on the fence is now in progress.

From July 16 to 19 I was on the Island of Kauai, primarily to inspect the forest fence across the government land of Wailua, mauka, above Lihue. This stretch of fence closes the gap between existing forest fences built and now maintained respectively by the Lihue Plantation and the Makee Sugar Company. The Wailua fence was built under contract by Mr. Kaina D. Lovell of Anahola, who did his work in a thoroughly satisfactory way. The fence has five wires and is built of redwood posts set 20 feet apart, with two northwest spreaders between.

In connection with the fences now being built on the boundary of the Waiaha Spring forest reserve in North Kona, Hawaii, ar-

rangements have been completed for the erection of six of the Division of Forestry's metal forest reserve monuments at important corners.

During the last week of the month a final inspection was made of the forest fence on the mauka boundary of the Ninole homestead tract, Kau, Hawaii. The minor repairs and additions found necessary at the time of the first inspection having been made, and the fence now being in good condition, the job was accepted as completed.

Reconstruction of Forest Fences in Kau.

As the result of a special trip to Hawaii, July 25-31, I have here to report as follows on the condition of the fences on the boundaries of the Kau forest reserve. These fences, it will be recalled, were the subject of considerable discussion during 1912, between the board and the adjoining plantation companies, as the result of which the fences along the whole mountain section of this reserve, at both its east and west ends, have been or are about to be reconstructed. Under the requirements of government leases the Hawaiian Agricultural Company and the Hutchinson Sugar Plantation Company are under obligation to maintain the fences around the Kau forest reserve, but by mutual agreement with these companies, Mr. A. W. Carter, representing the Kahuku Ranch, has arranged to fence portions of the line along the Kahuku boundary. This boundary has recently been relocated by Mr. G. F. Wright. Most of the way along Kahuku the reconstructed fence is on the line determined by him.

The section of the Kau forest reserve fence built by the Hawaiian Agricultural Company runs from a point in Wood valley eastward through the government land of Kapapala, up through the forest on that land, and then westward to and along the Kahuku boundary, for a distance of something over five miles from the Kahuku-Kapapala corner.

Kahuku Ranch then has a section of about five and a half miles. This has not yet been built. Then comes the fence built by the Hutchinson Plantation, a stretch of approximately seven and a half miles, to the corner where the land of Kahuku turns makai. There is a stone wall down this line for two miles or so. The remainder of it is to be fenced by Kahuku Ranch.

Going first to Naalehu I inspected the section of the fence erected by the Hutchinson Plantation, on the mauka side of the forest. This fence is built of four wires, German make, No. 4, galvanized on iron. The posts are set 10 feet apart, of ohialehua, seven feet long, with a minimum diameter of 8 inches. Acting for the manager of the plantation, Mr. George Gibb, the actual construction of the fence was under the direction of Mr. Eric H. Edwards, manager of the Waiohinu Ranch. This fence is a satisfactory one in every way. It should give good service.

Under an arrangement with the owners of Kahuku Ranch,

Mr. W. H. Shipman has recently completed a clearing out of the wild stock on the mountain. Only a very few head of wild cattle are now left in the forest and these are being hunted by the adjoining ranchmen.

Around the east end of the reserve the fence of the Hawaiian Agricultural Company was entirely rebuilt during the year 1913. The former fence line was followed so that advantage could be taken of post holes blasted in the pahoe-hoe, but new posts were set throughout and new wire used. The total length of this fence is approximately 15 miles. The wire is of the best English make, galvanized No. 7. There are five strands in the fence. The posts, ohia-lchua or split koa, are set eight feet apart, and are almost without exception larger than the minimum diameter requirement of 8 inches. Wherever necessary the posts are guyed and braced. Especial care was taken across gulches and ravines to make the fence tight with extra wires. An excellent piece of work, this fence ought to be good for many years of effective service.

One more stretch of forest fence, across the Bishop Estate land of Punaluu, has also recently been completed by the Hawaiian Agricultural Company. This, with two lateral fences, respectively along the side of the Puu Enuhi ridge and adjoining the cane fields on Mohokea, completes the line of fences surrounding the east end of the Kau forest reserve. Between the regular forest fence and the cane field fences above Pahala, the entire east end of the reserve is now protected from the entrance of stock. All these forest fences were constructed under the personal supervision of Mr. Julian Monsarrat, who, for almost twenty years now, has efficiently carried out the wishes of the Hawaiian Agricultural Company in protecting this part of the Kau forest.

Reports and Statements.

During July I prepared for transmission to the Governor a statement of the work of the Division of Forestry for the past fiscal year, drew up a revised estimate of expenditures for the next six months, for the use of the commissioners; and wrote two reports recommending the creation of a forest reserve in the districts of Kipahulu and Kaupo, Maui, and of a so-called "forest park" along the Volcano road, Oloa, Hawaii. A public hearing to consider these projects has been set by Governor Pinkham for August 19, 1914.

The Planting on Kauai.

While on Kauai early in July, I visited the Papaholahola Spring reserve above Homestead, where, under the immediate direction of Mr. Walter D. McBryde, the Division of Forestry maintains a sub-nursery for the growing and local distribution of seedling trees, and an experimental ground for the trial of new species.

Conditions at the nursery were found to be very satisfactory. Through the recent improvement of the road the station has been made much more accessible. This should help to increase the number of plants that are annually given out. The blocks of trees in the area above the nursery are doing well. Provisional arrangements were made with Mr. McBryde for extending these plantations with other trees.

In this connection I wish officially to call attention to the tree planting by homesteaders and others in the vicinity of Homestead that has been going on in the last few years. Largely as a result in the first instance of Mr. McBryde's own efforts, the planting around Kalaheo has become general, so that now, looking mauka from Kukuilono hill, one sees a condition of shaded roads and tree surrounded homes equaled by no other place in the Territory. Kukuilono Park itself—the block of government land on the hill of that name which Mr. McBryde has beautified and thrown open to the free use of the public—has now become one of the attractions of Kauai. It is well worthy of being featured as an asset of the Garden Island that should not be overlooked.

Routine and Nursery Work.

As usual the staff of the Division of Forestry was kept busy during July with its regular routine work. The report of the forest nurseryman, transmitted herewith, gives the details of the plant growing and distribution.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, July 31, 1914.

R. S. Hosmer, Esq.,

Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of July:

Nursery.

Distribution of Plants.

	In seed boxes	In boxes transplanted	Pot grown	Total
Sold		274		274
Gratis	10,000	460	2232	12,692
Military Posts		606		606
Schools		120		120
	10,000	460	3232	13,692

Mr. W. H. Shipman has recently completed a clearing out of the wild stock on the mountain. Only a very few head of wild cattle are now left in the forest and these are being hunted by the adjoining ranchmen.

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	10,000	460	3232	13,692

Collections.

Collections on account of plants sold amounted to.....	\$ 6.20
Rent of building, nursery grounds.....	35.00
Total	<u>\$41.20</u>

Plantation Companies and Other Corporations.

The distribution of plants under this heading amounted to 500 in seed boxes and 168 pot grown. Total, 668.

We have received an order for 20,000 assorted tree seedlings to be delivered in September. Mention was made in a former report of receiving an order for 50,000 seedlings to be delivered before the end of the year, making 70,000 altogether for the coming planting season.

Makiki Station.

The work at this station has been principally the raising and transplanting of seedlings, attending to the new introductions and adding to our stock which we are getting ready for the coming Arbor Day and the general planting season.

Honolulu Watershed Planting.

The koa and kukui trees planted on and in the neighborhood of Sugar Loaf hill are doing very well. The two men are keeping them clear of weeds and grass and are also getting ready a stock of trees in case they should be required for additional planting in the near future.

Advice and Assistance.

The writer has answered inquiries and made visits as follows: By telephone, 6; by letter, 3; at nursery, 7; visits, 9.

Respectfully submitted,

DAVID HAUGHS,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, Aug. 14, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography for July, 1914, is respectfully submitted:

Kauai.

Heavy rainfall on the uplands and on windward Kauai continued during the month. A rain gage maintained at a new station on the Lumahai stream at an elevation of about 700 feet above the sea level has recorded an average of an inch a day during the past two months.

Mr. Dort, assisted by Mr. Horner, completed a Stevens automatic clock register station on the Wainiha stream at an elevation of about 850 feet above sea level, and about one and one-half miles above the power canal intake. The construction of this station, which will record the entire flow of the stream, consumed the greater part of the month. This installation completes the construction work started nearly a year past in relation to the measurement of all large windward Kauai streams which, with the exception of the Wainiha stream, are practically all wasting into the sea. This group of streams is made up of the Wainiha, Lumahai, Waioli, Hanalei and Kalihiwai streams, with an estimated minimum discharge at the 750 feet level of about 260 million gallons per 24 hours. It is believed that in time, these waters will be diverted into a large irrigation and power project which will serve leeward Kauai. For topographical reasons it is believed that the water will be diverted at an elevation of about 700 feet and the measurement stations were all established above this level.

The installation of these stations has involved an immense amount of hardships and labor under the most adverse conditions to be found on the island. Many miles of foot trail have been constructed up the various valleys. All supplies to all but the Wainiha station had to be carried in on men's backs and the work was completed under disagreeable weather conditions. The stations are of a permanent type, and the records therefrom will prove of immense value to Kauai water users. Of the five streams, two, the Hanalei and Waioli, are owned by the Territory of Hawaii.

Oahu.

Seven coöperative clock register stations were established during the month. Five of these, which were constructed and established by Mr. Kimble, were Stevens automatic clock register stations for the Kahuku and Laie plantation companies on windward Oahu. These stations will measure the run-off of the Malaeka-

hana, Koloa, Waialele and Kahawainui streams. The remaining two were clock register stations established in coöperation with the U. S. Army on the lower south fork of the Kaukonahua, just above Wahiawa reservoir and on the Schofield Barracks water supply ditch, above the storage reservoir. These were constructed by Mr. Kimble in June, but the clock registers were not available until July.

Station sites were selected for weir stations in connection with the experimental work in relation to water duty for cane and ditch seepage losses which is to be taken up with the H. S. P. A. Experimental sub-station at Waipio.

Miscellaneous measurements taken on July 10 showed the total discharge of the Waiau springs near Waiau, Oahu, to be about eleven million gallons per day.

On July 23 a reconnaissance was made in the vicinity of Leilehua gulch with the superintendent of the Hawaii Preserving Co. at Wahiawa in connection with the possibility of drilling a well in that vicinity to investigate underground water conditions. The entire cost of this work will be borne by the coöperating company.

Mr. Kimble spent the entire month in the field on construction. Mr. Austin spent 17 days in the field on stream and rain gaging work, including nine days on Maui, and the remainder of the month in this office on computation and filing work.

Mr. Bailey spent from July 8 to 18th in the Honolulu office on Maui computation work.

Maui.

Maui enjoyed its fourth consecutive month of abnormally wet weather. Mr. Bailey spent 16 days in the field, during which time he visited 30 stream gaging stations, made 19 stream measurements at regular stations, including a number of flood measurements, and completed the construction of three foot bridges for flood measurements. During July 19 to 29th Mr. Austin accompanied Mr. Bailey and visited all clock register stations on Maui.

Hawaii.

On July 29 to 31 the undersigned accompanied the deputy attorney-general of the Territory of Hawaii to Kamuela, Hawaii, and made a number of stream and ditch measurements. These records with other data collected will probably be used as evidence in future litigation relative to the water rights of the Wai-koloa stream.

AUGUST PLANS.

Kauai.

The greater part of the month will be devoted to stream measurements. Should the coöperative parties be ready construction

work will be started on the two clock register cooperative station on the Olokele stream and the new Anahola ditch. All equipment, materials, transportation and labor for the Olokele station will be furnished by the Hawaiian Sugar Co. All materials, transportation and labor will be furnished by the Makee Sugar Co. on the Anahola ditch station.

Oahu.

The coöperative experimental work for the H. S. P. A. at Waipio will be carried forward.

Further reconnaissance work in connection with the water resources of the Honolulu basin will be done.

A reconnaissance of the mountain waters of the Punaluu and Kaluanui valleys, above the 800-foot contour, will be made.

Mr. Kimble, who will probably be paid from territorial funds during August, has received permission to take 40 days' vacation leave, and will leave for Clear Lake, Iowa, on August 5. He expects to return about September 13.

Kauai.

Routine stream measurement work will be pushed, and a special ditch loss investigation for the Honolua Ranch Co. will be made.

• Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

CREATION OF TWO FOREST RESERVES.

Following a public hearing, Governor L. E. Pinkham on August 20, 1914, signed proclamations creating two new forest reserves, respectively on the islands of Maui and Hawaii.

The former, under the name "Kipahulu Forest Reserve," is situated in the districts of Kipahulu and Kaupo, and embraces all the forested area lying on the slopes of Mt. Haleakala above a line drawn approximately on the 2000-foot contour between the boundary of the old Hana district and the Kaupo gap. The area is 10,600 acres, of which 4600 acres belongs to the government. The remainder of the reserve consists of the great valley of Alae-nui, owned by the Kipahulu Sugar Co. The object of this reserve is to protect the streams, in view of their ultimate development for economic purposes.

The creation of the Kipahulu forest reserve practically rounds out and completes the first chapter in getting native Hawaiian forest under a proper system of administration and control. With the exception of two comparatively small areas on Oahu—Moku-leia and Hauula—all the forest land needed for the protection of

the watersheds of the important streams has now been technically set apart. A large percentage of the boundaries is fenced, and in most of the reserves trespass has now been reduced to small extent. But properly to care for the forest reserves, so that they shall render full service to the Territory, requires the organization of an efficient forest ranger service. This is the next step in forest work in Hawaii; the second chapter in making the native forests of the greatest value to all the people.

The other reserve, set apart on August 20, is called the "Olaa Forest Park," and consists of three blocks of Hawaiian forest along the Volcano road, near Glenwood, Olaa, Hawaii. The purpose of this forest park is to preserve, because of its scientific interest and scenic value, the only remaining tracts of native Hawaiian forest that are within easy reach of the tourist and visitor. The area of the Olaa forest park is 531 acres. It is set apart under the Board of Agriculture and Forestry largely for administrative reasons, being in the nature of a park rather than a forest reserve pure and simple, which is made primarily for economic reasons.

With these two new reserves, the total area of the 37 forest reserves now making up the Hawaiian forest reserve system is 798,214 acres. Of this, 546,222 acres (68 per cent) is land belonging to the Territory.

Following the usual custom, the reports of the superintendent of forestry on the Kipahulu forest reserve and the Olaa forest park are printed herewith, as are also the proclamations creating these reserves.

KIPAHULU FOREST RESERVE.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, July 16, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu, Hawaii.

Gentlemen:—I have the honor to submit as follows a report recommending the creation of a forest reserve in the districts formerly known as Kipahulu and Kaupo, Island of Maui, now classed as a part of Hana. The area in question embraces all the lands mauka of a line drawn on approximately the 2000-foot contour, between the Hana-Kipahulu district line and the boundary of the fee simple land of Kakio, on the wet side of the Manowainui gulch, below the Kaupo gap into the crater of Mt. Haleakala. The area of the proposed reserve is approximately 10,600 acres. With the exception of the great valley of Alaenui, in Kipahulu, owned by the Kipahulu Sugar Company, practi-

cally all of the land included in the reserve belongs to the Territory.

The greater part of the proposed forest reserve is land very much cut up by gulches and ridges. It rises steeply from the strip of agricultural land near the sea. The upper portions of the lands included are on the ridges bounding the crater of Haleakala. It is all under a stand of native Hawaiian forest. I suggest that the reserve be called the Kipahulu Forest Reserve.

Object.

The object in creating this forest reserve is to provide for the better protection of a series of watersheds that potentially are of importance in the development of the Territory. A number of small valleys carrying streams having more or less permanent flow are included in the reserve, but essentially the important sources of water are the streams within the tributary to the Alae-nui and Manawainui gulches. Water from the former is now diverted and used on the Kipahulu Sugar Plantation. That in the latter gulch is not now used, except in a small way for taro patches in the valley. In both these gulches there appear to be great possibilities for the development of power. It may be a long cry ahead to the time when the water that goes over these particular falls will be harnessed, but in my judgment provision ought to be made now for giving adequate protection to the sources of the supply. The setting apart as a forest reserve of the government lands on which these streams rise is an essential step in that direction.

The creation of the Kipahulu forest reserve has been contemplated for a long time. My recommendation that it be established rests on several visits to Kaupo and Kipahulu, but particularly on one made in June, 1914, with this especial object in view. The creation of the Kipahulu forest reserve will round out the forest reserve system on Maui and practically complete the chain of forest reserves needed throughout the Territory.

Description.

On the east side of Kipahulu, from the Hana district line to and including the government land of Kikoo, the government lands are under lease to the Kipahulu Sugar Company under two leases, No. 488 (expiring March 6, 1915) and No. 522 (expiring December 20, 1919). The latter covers only the lower portion of the several lands included, leaving a balance of 809 acres, of the portion under forest, not under lease. The government lands on the western side of Kipahulu are not under lease. Across Kipahulu the boundary line of the proposed forest reserve runs at or a little mauka of the upper edge of the land that has been cleared

for cane. Some of the upper fields have been abandoned in late years, but it is believed that this line marks about the limit of profitable agriculture, even if with better times these upper lands are again brought under intensive cultivation. Further mauka, especially on the western side of Kipahulu, the topography is very broken, making the land unsuited for anything but forest.

In Kaupo is one good-sized private land, Kaapahu, the upper part of which would naturally fall within the limits of the forest reserve. But in that the owner of the land, Mr. R. A. Drummond, intends to continue to use it for grazing, it has been deemed best to leave Kaapahu out of the reserve. The boundary line therefore passes around this land. Kaapahu is bounded on both sides by deep and impassable gulches. The mauka boundary of this land will eventually have to be fenced, along with certain other land boundaries in both Kaupo and Kipahulu. When the present leases held by the Kipahulu Sugar Co. run out and come to be renewed, provision should be made for fences on the forest line where necessary. Fortunately, for a good part of the way natural barriers can be used.

The government land between Kaapahu and the Hanawainui gulch in Kaupo is the only section of the proposed reserve about including which in the reserve there is any question. This is a triangular area about 7000 feet broad at the base and running up steeply for an equal distance between large gulches, to a narrow neck near the hill Ahulili. Its makai boundary is now the mauka line of the Kaupo homesteads, laid out some ten years or more ago, and two or three private grants that stop at about the same elevation. The upper portion of this triangle is covered by a heavy stand of native forest, with ie-ie vines and other undergrowth. Lower down is a fairly uniform growth of young koa trees, 20 years or so old, apparently dating from a fire, with a scattering of larger koa trees. Along with the koa the waiawi (*Psidium pomiferum*) on this and adjoining lands is found spreading rapidly and making a better development than anywhere else in the Territory. It is here a valuable tree.

For some little way above the homestead boundary the forest is open and park-like in character, with a carpet of various forage grasses. There is no important source of water on this government land. The streams in the small gulches are only intermittent, the only spring of any consequence being one located way makai, not far above the government road, on private land. This area is not now under lease. It is, however, subject to grazing by cattle. At present not very many head are at large, but there is nothing to prevent more from being turned loose at any time.

It is my judgment that the mauka portion of this triangle ought to be reserved, but that the lower section, immediately mauka of the homestead, might properly be leased for grazing. I have accordingly asked the Survey Office to fix the boundary

between arbitrary points, there being no established marks on the ground. This line will eventually have to be run out and located on the ground, at which time it should be marked with forest reserve monuments. The section below the proposed forest line could then be leased, with a provision that a fence be built running across from the Kaapahu gulch to the Manawainui pali, thus making a barrier on the forest reserve boundary.

Before fencing can be done, a number of points will have to be located and marked on the ground all the way across Hana, Kipahulu and Kaupo. This is work for which provision ought to be made. The section of boundary just suggested could be run out at the same time.

The Manawainui gulch itself, with its subdivisions, is already a natural reserve, but being all government land it had best be included in the forest reserve. Above the waterfalls and stretching up to the edge of the crater is a section of government land that was formerly used for grazing but which has been abandoned of late because it was so rough and also because the more open places had become overgrown with the weed pamakani. There is said to be only one entrance to this section—across a hogback leading in from near the trail up the Kaupo gap, at about the 4000-foot elevation. This trail is now fenced off. In that all this upper section, above Manawainui, is the source of the streams that drop into that gulch—water which I believe sometime will be required for power development,—it is my judgment that it should be included in the reserve. From conversations had with Mr. Antone Vierra and other ranch men in Kaupo, I think that such action will meet with favor rather than opposition.

Boundary.

The lower boundary of the proposed Kipahulu forest reserve may roughly be described as follows:

Starting at the southwest corner of the Hana forest reserve, the line runs across at the heads of the private grants on Kauhakani and Papaulauana to the mauka boundary of Grant 3248; thence across Alacui to the ridge of Palikea; thence at the head of the private grants on Kikoo and Maulili, across at approximately the elevation of the waterfalls in the main valleys to a point arbitrarily to be established on the eastern boundary of Kaapahu; thence around Kaapahu to a point on its western boundary approximately coinciding with latitude 20° 40'; thence across on this line to the pali of Manawainui gulch; thence into and across the gulch to include the government lands therein; thence up the boundary of Kakio to the Kaupo-Kipahulu district boundary; thence around and along the same to the point of beginning.

The official and technical description of the line is now being prepared by the Survey Office.

Recommendation.

For the reasons given above I do now recommend that the board approve the creation of the Kipahulu forest reserve and request the Governor of the Territory to hold the required hearings and thereafter to issue a proclamation setting the government lands apart.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

OLAA FOREST PARK.

REPORT OF THE SUPERINTENDENT OF FORESTRY.

Honolulu, Hawaii, July 15, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu.

Gentlemen:—I have to recommend as follows the creation of a small forest reserve in the Olaa section, Puna district, Hawaii, to be known as the "Olaa Forest Park Reserve."

The purpose of this project is to preserve for its beauty, its scenic interest and its scientific value the last remaining strip of the heavy native Hawaiian forest along the Volcano road, together with a grove of koa trees facing the road at 29 Miles. The former area consists of the untaken Olaa homestead lots bordering the Volcano road, mauka of Glenwood, between the twenty-three and the twenty-five-mile posts. It is the one place in the Territory where without effort or exertion the visitor to the Islands can still see the dense native forest in its primitive condition.

The Glenwood Forest.

The area proposed to be set apart consists essentially of lots Nos. 363, 364, 277 to 380, and 389 to 391 of the original Olaa Tract homestead subdivision, a total of 374 acres. All of these lots still vest in the government. The majority of them were never taken up. Those that were have since reverted to the Territory. All are covered with heavy forest, consisting of a stand made up principally of large ohialehua trees with a dense undergrowth of ferns, vines and shrubs. The lots named form a solid block across which runs the Volcano road. Adjoining this block are a number of privately-owned lots, on which the forest cover is of like character. It is the intention of the owners of these lots to continue to protect the forest on them. In effect this increases the size of the proposed reserve and insures the perpetuation of a block of forest large enough to maintain itself.

The government lots, especially those to the south of the road, are said to be extremely rocky, so that their value for agriculture would at best be but small. On the other hand the forest on these lots makes them, because of their location, of unique value to the Territory.

Ever since the Volcano road was first built, the Hawaiian forest along its course has been one of the most exploited features of the Island of Hawaii. With increasing attention to building up the tourist trade in the Territory it is strictly a business proposition to preserve and develop all places of special scenic attraction. From the tourist point of view the drive from Glenwood to the Volcano is a distinct asset.

"But this forest is not alone of interest from the superficial standpoint of the passing tourist. With the opening up of the surrounding country it will have increasing scientific interest from a botanical standpoint, while it may also well serve as a refuge for some of the remaining Hawaiian birds.

These being the objects of the reservation, it is to be regarded as a forest park rather than as a regular forest reserve. But for purposes of administration it can best be handled if set apart under the Board of Agriculture and Forestry.

"The second area proposed to be included in the reserve is located further up the road at 29 Miles, a small block of forest, of seven and a half acres, that I believe should also be reserved, say as Section B of the Olaa forest park. This is the stand of koa trees nearly opposite Mr. W. H. Shipman's mountain place, that was held out of the "Olaa Summer Lots" subdivision as a special "koa reserve." This koa grove is an interesting feature of the Volcano road. As the trees grow older it will be of interesting value as a part of the park.

Volcano Road Strips.

While this matter is under consideration by the board, I should like to bring forward one more suggestion which may result in increasing the area of the proposed forest park. I bring it up separately, as it involves a question of policy.

When the original Olaa tract was laid out, narrow strips of forest were reserved along the Volcano road between the twelve and the twenty-four-mile posts, with the idea of preserving the forest, just as is now proposed on a smaller scale. Unfortunately the strips were not made wide enough. When the land behind them was opened up many of the trees on the strips died. The result was that below about the eighteen-mile post the former "forest reserve" strips are now merely remnants of open land, which are now and for years have been subject to trespass; sources of annoyance to all concerned.

Mauka of the "Peck Road" at eighteen miles there is still a fair

stand of forest on some of the strips, increasing in density toward and above Glenwood. But even where the native trees have pretty much gone there exists here, should the board deem it wise to take advantage of it, good opportunity for the planting in their stead of introduced trees of suitable species.

At present the government probably has no funds that it would care to use for such work, but in time conditions may so change as to make such planting possible. For this reason it seems to me desirable that these remnants be added to and set apart as portions of the Olaa forest park.

The Board of Agriculture and Forestry has, of course, no authority or control over these strips, nor voice as to their disposition, other than as a matter of general government policy. As concerns those below eighteen miles, my personal recommendation as superintendent of forestry is that they no longer be held for forest purposes, but disposed of under the law, as the Department of Public Lands may see fit, as agricultural land. Below eighteen miles the original forest is gone. The strips there can in my judgment be used to better advantage for agriculture than for tree planting.

I believe it would be good business for the government to clean up in this way what is now an unsatisfactory land muddle.

For the reasons set forth I do therefore now recommend that the board approve the project of setting apart as the Olaa forest park reserve the three sections of government land above described, and that the board request the Governor to take the necessary steps to have the lands so set apart.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF
HANA, ISLAND AND COUNTY OF MAUI,
TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said Acts provided, do hereby recommend and approve as a forest reserve to be called the KIPAHULU FOREST RESERVE, those certain pieces of government and privately-owned land in the District of Hana, Island and County of Maui, Territory of Hawaii, which may be described roughly as embracing all the lands mauka of a line drawn on approximately the 2000-foot contour across the land districts of Maui formerly known as Kipahulu and Kaupo, between the Kaupo Gap and the boundary of the old Hana District, and containing an area of 10,600 acres, more or less, more particularly described by and on maps made by the government survey department of the Territory of Hawaii, which said maps are now on file in the said survey department marked Government Survey Reg. Map No. 1782, and "KIPAHULU FOREST RESERVE," and a description accompanying the same numbered CSF 2545, which said description now on file in said Survey Department is as follows:

KIPAHULU FOREST RESERVE.

District of Hana, Island of Hawaii.

Including portions of the Government lands of Kaumakani-Alaeiki, Kaka-hale-Kikoo, Kukuila, and Kaniaula, and of the privately-owned land of Alaenui.

C. S. F. No. 2545.

Beginning at the East corner of this Reserve and the South corner of the HANA FOREST RESERVE, said point of beginning being approximately 4348.5 feet North and 4310.2 feet East of Government Survey Trig. Station "Ahuula," as shown on Government Survey Registered Map No. 1782, and running by approximate true azimuths and distances:

1. 58° 30' 380 feet along Government land;
2. 53° 45' 2026 feet along Grant 3057 to Nakila and Company;
3. 63° 40' 2430 feet across Government land;
4. 57° 30' 330 feet along Grant 3248 to Kunukau;
5. 356° 30' 1700 feet across Alaenui to Trig. Station Ahuula;
6. 51° 00' 265 feet along Grant 2795 to Kaleimakalii;
7. 70° 00' 281 feet along Grant 2795 to Kaleimakalii;
8. 62° 30' 465 feet along Grant 2795 to Kaleimakalii;
9. 75° 20' 970 feet along Grant 1529 to Makaliku and Ihu;
10. 75° 20' 1000 feet along land of Maulili;
11. 70° 00' 3600 feet across Government land to East boundary of land of Kaapahu (L. C. A. S559B to W. C. Lunailo);
12. 156° 10' 9600 feet along said land to Kaapahu;
13. 83° 10' 5148 feet along said land of Kaapahu;
14. 330° 20' 4970 feet along said land of Kaapahu;
15. 90° 00' 6160 feet across Government land to center of Manawainui Gulch;
16. Thence along center of Manawainui Gulch, direct azimuth and distance being 16° 30' 4000 feet;
17. 95° 20' 500 feet across Government land and along land of Kumunui;
18. 18° 30' 1600 feet along land of Kumunui;
19. 10° 00' 160 feet;

20. 125° 10' 1725 feet along Grant 2134:1 to Loheauma;
21. 4° 30' 600 feet along Grant 2134:1 to Loheauma;
22. 355° 00' 200 feet along Grant 2134:1 to Loheauma;
23. 87° 00' 780 feet along Grant 1449:2 to Kanakaokai;
24. Then along Grant 3457 to A. V. Maieial and along top of ridge on East boundary of Kakio to the North corner of Government land and West boundary of Alaenui, the direct azimuth and distance being 178° 15' 19,075 feet;
25. Thence along top of ridge to boundary point Palaha, the direct azimuth and distance being 162° 10' 6700 feet;
26. Then along boundary of Hana Forest Reserve to boundary point Kaumakani, direct azimuth and distance being 288° 30' 26,500 feet;
27. 330° 40' 10,350 feet along Hana Forest Reserve to the point of beginning.

Area, 10,600 acres.

And as provided by law, subject to the existing rights and leases, I do hereby SET APART as parts of the KIPAHULU FOREST RESERVE those portions of the government lands of Kaumakani-Alaeiki, Kakahale-Kikoo, Kukuila, Kaniaula, altogether an area of 4600 acres, more or less, that lie within the metes and bounds of the above described KIPAHULU FOREST RESERVE.

IN WITNESS HEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

DONE at the Capitol in Honolulu, this 20th day of August, A. D. 1914.

LUCIUS E. PINKHAM,
Governor of Hawaii.

By the Governor:
WADE WARREN THAYER,
Secretary of Hawaii.

BY AUTHORITY.

PROCLAMATION OF FOREST RESERVE IN THE DISTRICT OF PUNA, ISLAND AND COUNTY OF HAWAII, TERRITORY OF HAWAII.

Under and by virtue of the authority vested in me by the provisions of Chapter 28 of the Revised Laws of Hawaii, as amended by Act 65 of the Session Laws of 1905, and by Act 4 of the Session Laws of 1907, and of every other power me hereunto enabling, I, LUCIUS E. PINKHAM, Governor of Hawaii, with the approval of a majority of the Board of Commissioners of Agriculture and Forestry, having held the hearing of which notice has been duly given as in said Acts provided, do hereby set apart as a forest reserve to be called the OLAA FOREST PARK RESERVE, those certain pieces of government land in the District of Puna, Island and County of Hawaii, Territory of Hawaii, which may be roughly described as the remaining area of government land along the Volcano Road under a stand of heavy Hawaiian forest, and containing an area of 531 acres, more or less, more particularly described by and on maps made by the government survey department of the Territory of Hawaii, which said maps are now on file in the said survey department marked Government Survey Reg. Maps Nos. 2250, 2411 and 2577 and "OLAA FOREST PARK RESERVE," Sections A, B, and C respectively, and descriptions accompanying the same in two parts numbered C. S. F. 2538 and 2544 (the description of Section C, the road strips, appearing directly on Map No.

2577), which said descriptions now on file in the said Survey Office are as follows:

OLAA FOREST PARK RESERVE.

Olaa, Puna, Hawaii.

SECTION A.

Including Lots 363, 364, 377, 378, 389, 390, 391 and portions of Lots 379 and 380, of the Olaa Reservation Lots.

C. S. F. No. 2538.

Beginning at the East corner of Lot 365 of the Olaa Reservation Lots (Grant 4345 to E. G. Hitchcock) at the junction of 30-foot side road with the Volcano Road, the coordinates of which point are 47,311.24 feet South and 37,490.65 feet West of Government Survey Trig. Station "Olaa," as shown on Government Survey Registered Map No. 2250, and running by true azimuths:

1. 304° 12' 2975.0 feet more or less across Volcano Road and along the Southwest side of a 30-foot road to a point in middle of old Volcano Road;
Thence along the land of Keanu along the middle of the old Volcano Road, the direct azimuths and distances being:
2. 55° 15' 2750.0 feet more or less;
3. 39° 20' 1477.0 feet more or less;
4. 63° 00' 930.0 feet more or less;
5. 124° 12' 4905.0 feet more or less along the Northeast side of a 30-foot side road, across the Volcano Road to the West corner of Lot 389 of the Olaa Reservation Lots;
6. 214° 12' 1200.0 feet along Lot 1 of the Brughelli Settlement Association Lots;
7. 304° 12' 561.0 feet along Right of Purchase Lease No. 155 to Mrs. B. Bergstrom (Olaa Reservation Lots);
8. 249° 45' 976.0 feet along Right of Purchase Lease No. 155 to Mrs. B. Bergstrom (Olaa Reservation Lots);
9. 304° 12' 2689.0 feet along Right of Purchase Lease No. 155 to Mrs. B. Bergstrom (Olaa Reservation Lots) to the Volcano Road;
10. 211° 49' 430.0 feet along the Northwest side of the Volcano Road to the North corner of the Volcano Road and a 30-foot side road;
11. 124° 12' 150.0 feet along the Northeast side of a 30-foot side road to the South corner of Grant 4547;
12. 211° 49' 601.0 feet along Grant 4547 to Mrs. J. C. McStay;
13. 304° 12' 150.0 feet along Grant 4547 to Mrs. J. C. McStay;
14. 211° 49' 400.0 feet along Grant 4547 to Mrs. J. C. McStay along the Northwest side of Volcano Road;
15. 124° 12' 150.0 feet along Grant 4547 to Mrs. J. C. McStay;
16. 211° 49' 200.0 feet along Grant 4547 to Mrs. J. C. McStay;
17. 124° 12' 309.0 feet along Grant 4547 to Mrs. J. C. McStay to the South corner of Grant 4345 to E. G. Hitchcock;
18. 214° 12' 801.0 feet along Grant 4345 to E. G. Hitchcock;
19. 304° 12' 213.0 feet along Grant 4345 to E. G. Hitchcock;
20. 211° 50' 400.0 feet along Grant 4345 to E. G. Hitchcock to the point of beginning.

Area, 380 acres, more or less.

Excepting and reserving therefrom that portion of the Volcano Road passing through this tract (area, 6 acres), leaving a net area of 374 acres, more or less.

SECTION B.

Being the Koa Grove Reservation in the Olaa Summer Lots Subdivision.

C. S. F. No. 2544.

Beginning at the West corner of the Volcano Road and Kalanikoa Road,

the coordinates of which point referred to Government Survey Trig. Station "Kulani" are 34,351.6 feet South and 20,278.6 feet East, as shown on Government Survey Registered Map No. 2411, and running by true azimuths:

1. 50° 98' 310.0 feet along new line of the Volcano Road;
2. 33° 04' 245.8 feet along new line of the Volcano Road;
3. 149° 31' 707.7 feet along the land of Keauhou to an ohia post;
4. 239° 31' 525.9 feet along Lot 2, Block C, of the Olaa Summer Lots (Grant 5645 to Thos. E. Cook), to an ohia post;
5. 329° 31' 547.6 feet along Kalanikoa Road to the point of beginning.

Area, 7 32-100 acres.

AREAS.

Section A—37½ acres,

Section B— 7.32 "

Section C—150 "

531.32 "

(Seal)

IN WITNESS WHEREOF, I have hereunto set my hand and caused the Great Seal of the Territory of Hawaii to be affixed.

DONE at the Capitol in Honolulu, this 20th day of August, A. D. 1914.

LUCIUS E. PINKHAM,
Governor of Hawaii.

By the Governor:

WADE WARREN THAYER,
Secretary of Hawaii.

BY AUTHORITY.

RULE AND REGULATION OF THE BOARD OF COMMISSIONERS OF AGRICULTURE AND FORESTRY, FORESTRY RULE NO. 1, CONCERNING THE PROTECTION OF THE WATERSHEDS IN NUUANU AND MAKIKI VALLEYS, HONOLULU, T. H.

The Board of Commissioners of Agriculture and Forestry of the Territory of Hawaii hereby makes the following Rule and Regulation for the purpose of protecting from contamination the watersheds tributary to the Honolulu water supply system, within the boundaries of the Honolulu Watershed Forest Reserve:

SECTION 1. All persons and corporations are hereby prohibited from cutting or removing grass and other forage plants except under such permits as may be issued from time to time by the Board of Commissioners of Agriculture and Forestry (1) from the government land in Nuuanu Valley, Honolulu, Oahu, lying within the boundaries of the Honolulu Watershed Forest Reserve, as established by a proclamation signed by Acting Governor E. A. Mott-Smith on October 13, 1913, which area, in part, includes the entire mauka portion of Nuuanu Valley above Laukaha; and (2) from all that portion of Makiki Valley lying mauka of the Makiki Dam, on the government land of Makiki (also included in the above-named forest reserve), as shown by registered map No. 2554, on file in the office of the government survey.

SEC. 2. Any person violating the above rule shall be guilty of a misdemeanor, and upon conviction thereof shall be punished by a fine not to exceed Five Hundred Dollars (\$500.00), as provided by Section 390 of the Revised Laws as amended by Act 82 of the Session Laws of 1905, and Act 112 of the Session Laws of 1907.

SEC. 3. This rule shall take effect upon its approval by the Governor.
Approved:

(Sgd.) LUCIUS E. PINKHAM,
Governor of Hawaii.

Honolulu, Territory of Hawaii, August 22, 1914.

APPOINTMENT OF FIRE WARDEN.

Notice is hereby given that the Board of Commissioners of Agriculture and Forestry has appointed

L. A. MOORE

District Fire Warden in and for Nuuanu Valley, District of Honolulu, Oahu.

ALBERT WATERHOUSE,

Acting President and Executive Officer, Board
of Agriculture and Forestry.

Honolulu, T. H., September 5, 1914.

Notice is hereby given that the following appointments of District Fire Wardens on the Island of Maui have been made by the Board of Commissioners of Agriculture and Forestry:

WILBUR A. ANDERSON

in and for that portion of the District of Koolau, Maui, lying to the East of Makapipi Gulch,

W. F. POGRE

(modification of district) in and for the East half of the District of Hamakualoa and that portion of the District of Koolau lying to the West of Makapipi Gulch.

ALBERT WATERHOUSE,

Acting President and Executive Officer, Board
of Agriculture and Forestry.

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THE HAWAIIAN FORESTER AGRICULTURIST

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No. 10

PUBLICITY FOR PREVENTION.

In his report for August the Territorial veterinarian returns to the subject of inefficient dairy inspection and sanitary control, in terms that add force to the editorial remarks in the September number. That 228 dairy cattle, the first lot treated in the present annual test for tuberculosis on this island, refused to react is to Dr. Norgaard "a very promising beginning," but he adds to that view the statement that "it hardly justifies the anticipation of greatly improved total results when viewed in connection with the bacterial counts of 35 samples of milk" presented in his report but withheld from publication. He says that these counts "demonstrate beyond a doubt that a large percentage of the local dairies are disregarding even the simplest sanitary methods for the production of clean milk, and it is therefore not surprising that those dairies which have not yet succeeded in stamping out bovine tuberculosis, after four years' efforts, now find the disease on the increase."

With all the warning that has been given during several months past, in the reports of the Division of Animal Industry, time ought to be about ripe for inflicting on the delinquent dairymen the penalty of publicity. Before the passage of the milk ordinance and the anti-tuberculosis campaign of the division mentioned, when the only efforts to ensure honest and clean milk for Honolulu consumers were those of the pure food branch of the Board of Health, there is no doubt that a large part of the battle, so far as it was successful, consisted in the regular publication in the newspapers of the detections and convictions of persons who sold milk that was diluted or below standard in nutritive contents. Why publicity should not be employed now against those who sell milk charged with noxious bacteria, due to unclean dairying methods, is a question that might well be taken under deliberation.

COMING KING COCONUT.

The following extracts from articles in the initial number of the *Tropical Mail* (London) ought to be of great interest in Hawaii, where the systematic cultivation of the coconut for commercial purposes has recently been started:

WORLD'S COCONUT PRODUCTION.

The matter which at the moment of writing engages our attention is the copious issue of books on the subject of the cultivation of the coconut. As happened in the earlier days of the rubber and other industries which have rapidly assumed exceptional importance, a number of books and pamphlets are being published upon the subject of coconuts, and many articles are now appearing thereon in the public press—all of which are "signs of the times," and are the usual forerunners and customary indicators of great activity.

These books and articles no doubt serve a useful purpose. Some of them are excellent and accurate, and from all there is to be obtained some information of value. On the other hand, we have seen statements therein which show their authors somewhat too ready to compile statistics of the world's production and European consumption, which cannot be supported by adequate evidence.

For instance, in one article the statement appeared that the world's exports of copra in 1913 amounted in value to £75,000,000 sterling, and that this did not represent a quarter of the total value of coconuts used, or, in other words, that the value of the world's coconut output exceeded £300,000,000 sterling per annum.

In another instance there is an estimate that the value of copra coming into Europe alone now represents some £60,000,000 sterling per annum.

Such extravagant estimates are misleading and to be deprecated; there is nothing to justify them. Accurate statistics as to the value of the world's production of coconuts are not available, nor are they very likely to be so for a long time, if ever.

Only very incomplete figures are available as to the production of copra, coconut oil and desiccated, but an estimate, not entirely unreasonable, formed upon these figures, leads us to put the coconut production of the world at something in the neighborhood of 6,500,000,000 nuts per annum.

Now, if we reckon 5000 nuts to go to a ton of copra, this represents 1,300,000 tons of copra, which at £30 per ton are worth £39,000,000. In addition to the copra, there are, however, to be reckoned the coconut fiber—a valuable item—and also cattle food cake and other important by-products. If the value of these

is added to that of the copra, the world's coconut production may reasonably be estimated at perhaps £50,000,000 per annum.

Whilst the world's population continues to increase, and whilst communities continue to advance towards what we have termed a "higher plane of living," the demand for and consumption of the coconut in the form of edible and industrial fats, fibers, yarns, and the many other articles, must continue to increase. There can be no limitation—the coconut is a necessity and not a luxury.

IMPORTANCE OF COCONUTS.

Perhaps the most important of many almost equally important products of the tropics is the coconut, the foundation and support of a score of great industries.

Though the consumption of coconuts has for many years been very large—and it must be noted that they form the principal food of the native populations of many of the countries in which they are grown—it has remained for recent scientific research to demonstrate the value of their products in the food and manufactures of civilized communities, and to show in what manner they may be utilized.

A mere enumeration of some of the principal of these uses and the manufactures which they support is sufficient to show how largely coconut properties enter into the every day life of the community.

Coconut butter (margarine), lard, desiccated coconut (biscuits, confections, cakes, sweets), cooking and burning oil, soap, candles, mats, matting, ropes, yarns, mattresses, cattle-food-cake, stuffing for furniture, imitation horsehair, brooms, brushes, etc.

SHORTAGE OF ANIMAL FATS.

Food must necessarily rank first in any list of articles, and among foods fat is one of the essentials for support of the human system. Hitherto the demand for this has been met by animal fats, the chief supply of which has been imported from foreign countries—the United States, etc. Of late years, however, a shortage in this supply has been manifested. This shortage is due not only to a diminution in the number of animals, but also to the fact that the countries hitherto exporting a surplus of their animal fats have so largely increased in population that they need all they can raise for their own consumption. The consequence is a serious shortage in this essential food, which is increasing and must continue to increase.

This deficiency in animal fat is filled by coconut butter, pure, scientifically prepared and free from all contamination, which we know under the name of margarine. How great a blessing mar-

garine has been to the working classes is known only by those who have mixed with them.

The housewife who has a large family to feed, and whose weekly allowance will not permit her to think of buying butter at 1s. 4d. to 1s. 6d. per lb., must yet give the children something wholesome and pure to eat; and plenty of it. If only she had an opportunity of expressing her views in this column, she would say that the greatest boon which has come to this class of the community, during the last few years, is the manufacture of coconut butter, the backbone of which is pure coconut fat.

SOME QUESTIONS ANSWERED.

So much we have said on the subject of the commercial value of coconut products. We will now consider questions which will naturally occur to any prospective planter or investor in plantations. These probably would be:

1. What is the cost of producing 1000 coconuts?
2. What is the market price of coconuts today?
3. How many years will the coconut palm continue to yield its crop?

The answers are as follows:

No. 1. The cost of producing 1000 coconuts, on a good estate, according to reliable figures, is 25s. to 30s., varying according to local conditions. This figure includes management of the estate, and expenses of every kind.

No. 2. A fair average price, whether converted into coconut oil, desiccated coconut, or copra; or whether the nut is sold in the flesh form, is from 90s. to 125s. per 1000.

No. 3. Well-attended palms will continue to produce, on well-kept estates, for upwards of fifty years.

It is therefore easy to see that there is a net annual profit, to the owner of the plantation, of over £3 per 1000 nuts; and that the various tropical countries are taking back from the world's buyers profits in hard cash, amounting to almost £20,000,000 sterling a year.

FOOD FOR THOUGHT.

These profits furnish, without doubt, food for thought to any commercial mind of the 20th century, for, in passing, it should be noted that even in 1903-4, when the market price of coconuts was only from £2 10s. to £3 10s. per 1000 and coconut oils stood at £22 and £24 per ton, the far-seeing man, whose brain was quick enough to observe the signs of the times, gave the advice, "Invest in coconut plantations; it is a sound and good investment."

Unfortunately for many, his advice was disregarded, but today

coconuts are difficult to obtain in quantities, even at the advanced price of £5 to £5 10s. per 1000, and coconut oil has risen to somewhere in the neighborhood of £45 per ton. If in ten years science has enhanced the value of this product to an extent that seems almost incredible, it is the firm belief of farsighted men that it will do so again—and in a less space of time. Scientific investigation is keener every year, and what it accomplished between 1904 and 1914 it will do again between 1914 and 1924.

INDUSTRIES OF THE TROPICAL WORLD.

The man in the street thinks of coconuts as having no better use than being placed upon wooden pegs, at bank holiday time, for the children to knock down. It may surprise him to learn that the coconut show business in the British Isles absorbs only about $4\frac{1}{2}$ millions of coconuts, value £32,000 sterling per annum, which is a small fractional part of the turnover of £50,000,000 per annum. It may therefore with justification be said that the minds of the public require some enlightenment on the subject of this industry.

USES OF SUGAR.

Sugar and molasses are said to be used in the shoe-blackening industry to a considerable extent. Soap-making finds a use for sugar in the place of glycerine. Copying ink is made of one part of sugar added to three parts of ordinary ink. * * * The walls built in this island some two centuries ago are said to have been built with some molasses put into the mortar. Even in the tanning industry and in silvering of glass mirrors, they say sugar is used. We would urge scientists to go forward and find some more uses for our staple commodity in this progressive age.—*Barbados Agricultural Reporter*.

Experiments are being made in Honolulu with molasses as a binder of broken coral in road construction, oil having been proved unsuitable for mixing with coral, although the right thing for binding other macadamizing material.

Dr. Norgaard's technical discussions of diseases of live stock—as, for instance, what he says about a horse distemper on Maui in his August report—ought to be preserved by stock raisers and owners for reference and guidance. When, as in the case mentioned, such a simple thing as the providing of pure water for stock saves the lives of valuable animals, the proverb about the "ounce of prevention" acquires great force.

Importations of thoroughbred livestock of various kinds, which appear in almost every month's report of the Division of Animal

Industry, form one tangible index to progress in the agricultural enterprises of these Islands.

It is gratifying to note the apparent success being met in establishing in Hawaii both the African and the Australian parasites of various noxious flies which were introduced last year by Dr. Silvestri, the Italian scientist. There is considerable promise on the horizon that control of such pests by natural methods will prove more than a dream of enthusiasts. The results of the present expedition of Messrs. Fullaway and Bridwell, in Dr. Silvestri's tracks, will be patiently but eagerly awaited.

Mr. Ehrhorn's flanking tactics against plant pests beat anything in the war news, and the best of it is that his reports from the battle front are incontestable. He can show his dead, either in ashes or in the vials of his museum.

Mr. Hosmer has left the superintendency of forestry in Hawaii with the proud record of having established 37 forest reserves with an area of 798,214 acres, of which 546,222 acres, or 68 per cent, are government land. This Territory lacks mineral wealth, other than limestone, but the day is coming when it can derive revenue for maintaining public services from its forests, as well as from the conservation of water which the forests aid.

More than 2000 tree plants distributed in August is keeping up the record of forest wealth creation by the Division of Forestry.

An item in the report of Superintendent Larrison for August, which is proof in advance that the Division of Hydrography stands to be classed as a reproductive government enterprise, is the promise of a readjustment of charges in water leases. The Territory will be paid for value received by the lessees, and there will be equality of treatment which will tend to make those who may have to pay higher rates than the present ones contented.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, August 31, 1914.

The President and Members of the Board of Agriculture and Forestry.

Gentlemen:—I beg to report on the work of the Division of Animal Industry for the month of August, 1914, as follows:

BOVINE TUBERCULOSIS ERADICATION.

As will be seen from the appended report of the Assistant Territorial Veterinarian, a new general test has been begun, a

total of 228 dairy cattle being injected without a single reaction occurring. Though this is a very promising beginning, it hardly justifies the anticipation of greatly improved total results when viewed in connection with the bacterial counts of 35 samples of milk as herewith presented. These counts demonstrate beyond a doubt that a large percentage of the local dairies are disregarding even the simplest sanitary methods for the production of clean milk, and it is therefore not surprising that those dairies which have not yet succeeded in stamping out bovine tuberculosis, after four years' efforts, now find the disease on the increase.

In regard to the extension of the bovine tuberculosis control work to the other islands, I am pleased to state that during a recent visit to Maui I found the public disposition in regard thereto greatly improved, many milk producers having read with interest the published accounts of what has been accomplished on Oahu, and signifying their willingness to have their herds tested and to eliminate all diseased animals. The Maui deputy territorial veterinarian has therefore been supplied with 2000 doses of tuberculin and the same number of aluminum cartags, and will now pursue this work as fast as his time and opportunities will allow him. In the meantime 10,000 additional doses of tuberculin have been requisitioned from the Federal laboratories in Washington, and while notice has been received of the shipment of the same, it has not yet arrived, but will, upon receipt, be distributed in adequate quantities to the deputies on Hawaii and Kauai so that any milk producer in the Territory who so desires can have his herd tested and join the ranks of those who are helping to save human lives by furnishing non-infectious milk for the infants and children of these islands.

Appended to this report will be found a letter from the Chief of the U. S. Bureau of Animal Industry, pertaining to the bovine tuberculosis eradication work in the District of Columbia, with comments upon our work and methods here. Though the Federal authorities, with their unlimited means and facilities, have been engaged at this work for a slightly longer period than we, and though they are paying an indemnity of nearly 75% of the appraised value of all reactors destroyed, they have not yet succeeded in completely eradicating the disease, their last official record being 1.83 per cent of tuberculous cattle for the year ending June 30, 1913.

CEREBRO-SPINAL MENINGITIS IN HORSE STOCK.

During the latter part of August what threatened to be a severe outbreak of this disease was reported from Maui, and the writer, pursuant to the Board's instructions, proceeded to that island on August 31. Upon arrival it was found that six animals had died on one plantation, while one which was found in

a dying condition was destroyed for postmortem examination. The result of the latter was, as usual, negative in so far as actual pathological changes were concerned except for the presence of a number of aneurisms on the abdominal arteries, in which were found embedded the embryos of the armed wire worm (*Strongylus armatus*). The mature worm was also found in large numbers in the colon and cecum, but no trace of embryos or infarcts caused by these could be found in the brain. These intestinal and blood parasites play, in the writer's opinion, an important role as a direct, or at least a contributing cause to the appearance of that greatly-varying and complex series of symptoms in horses and mules which is most frequently referred to as cerebro-spinal meningitis, though admittedly a misnomer. As part of the life cycle of this parasite is spent in stagnant water, my efforts to prevent the repeated outbreaks of this disease have been principally directed toward the purification of the water supply on premises where the disease occurs regularly, and in a number of cases apparent success in suppressing the disease has resulted. The first rule is therefore to keep all horse stock away from stagnant water and especially to drain all water holes in the Sunday rest pastures where nearly all plantation draft animals are kept from Saturday afternoon till Sunday evening. When once infected such pastures are, however, not easily purified again, and when partly inundated by persistent rains the parasites are frequently carried to distant localities, where new centers of infection become established and a varying number of animals become infected and die. The disease is therefore always at its worst during the rainy season, making its first appearance from one to two weeks after the rains set in. In stables and yards where the water supply can be absolutely controlled much can be accomplished by filtering the water as it comes from the pipes or by said filters placed on open flumes. Medical treatment is of no use, as the embryos in the blood vessels cannot be reached by any form of medication now known to science, and our efforts must therefore be confined to prevention along the lines above indicated.

It is, however, encouraging to note that, even though it continued to rain nearly every day during the two weeks I remained on Maui, only one additional case came under observation, which fact would seem to indicate a decided diminution in the extent of the infection, possibly the direct result of preventive measures carried out during previous outbreaks or perhaps of unusual heavy downpours having washed most of the parasites to sea.

IMPORTATIONS OF STOCK FROM NEW ZEALAND.

After considerable effort permission has finally been obtained from the Secretary of Agriculture for the Parker Ranch to im-

port a number of very fine Merino rams from New Zealand via Sydney, Australia. Neither cattle nor sheep are allowed to enter the United States from any part of Australia, and as it has been practically impossible to obtain transportation for live stock from New Zealand to this Territory direct all importations from the Colonies have hitherto been barred. The Federal Department of Agriculture has, however, finally agreed to admit this shipment of fifty rams, transshipment at Sydney to be made under the supervision of the American consul at that place, the animals to be disinfected and quarantined upon arrival here. The correspondence on the subject will be found appended hereto.

ARRIVAL OF DOGS ON WARSHIPS AND TRANSPORTS.

This subject, which was discussed at length in my report for last month, is supplemented herewith by copies of the correspondence pertaining thereto. An unusually large number of dogs have arrived of late, not less than ten head during the month of August, of which number eight came on naval vessels or transports. Two of these arrived on the U. S. S. Rainbow, direct from the Philippines, in direct violation of the Federal regulations on the subject. These animals were destroyed by gas and the matter reported to Washington.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, August 31, 1914.

Dr. V. A. Norgaard, Chief of Division of Animal Industry.

Sir:—I beg to submit the following report for the month of August, 1914:

Tuberculosis Control.

The following dairy cattle have been tested during the past month:

	T.	P.	C.
Dr. Hansen	6	6	0
Waialae Dairy	1	1	0
Mr. Hopper	3	3	0
P. M. Pond	124	124	0
J. A. Templeton	94	94	0

From the above tabulated list it will be seen that 228 head of dairy cattle have been tested and all passed as free from tuberculosis.

Importations of Live Stock.

August 4—Wilhelmina, San Francisco: 1 dog (collie), Dr. H. F. Hollman; 3 crates poultry.

August 5—Shinyo Maru, Orient: 1 crate mandarin ducks, S. Sheba; 2 crates Japanese games.

August 10—Enterprise, San Francisco: 4 hogs (Tamworth), College of Hawaii; 1 horse, Mr. Ogg, Hilo, Hawaii.

August 10—Manoa, San Francisco: 3 crates poultry, Mrs. F. F. Baldwin, Maui; 1 crate poultry, A. White, Maui.

August 17—Chansler, Monterey, Cal.: 3 rabbits, Mr. Henderson.

August 18—Matsonia, San Francisco: 4 crates poultry.

August 20—U. S. A. transport Dix, Seattle: 397 horses, Quartermaster's Dept.; 1 dog, taken into quarantine while the Dix remained in port.

August 24—Sierra, San Francisco: 1 dog (Airedale), N. G. McCleare; 1 crate pigeons, W. F. X Co.

August 17—Hilonian, Seattle: 275 butcher hogs, A. L. Macpherson; 2 cows (Ayreshire), Cooke Ranch, Molokai; 1 bull.

August 17—U. S. S. Alert, San Francisco: 4 dogs, officers on board.

August 25—Lurline, San Francisco: 1 Holstein bull, 2 Holstein cows, College of Hawaii; 8 crates poultry, Sing Sing Co.

August 12—U. S. A. transport Thomas, San Francisco: 1 dog, Capt. Sibley.

Respectfully submitted,

L. N. CASE,
Assistant Territorial Veterinarian.

DIVISION OF ENTOMOLOGY.

Honolulu, August 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of August, 1914, as follows:

During the month 37 vessels arrived at the port of Honolulu, of which 18 carried vegetable matter and one vessel sand.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1099	23,100
Fumigated	2	101
Burned	30	52
Returned	1	1
Total inspected	1132	23,254

Of these shipments 23,065 packages arrived as freight, 132 packages as baggage of passengers and immigrants, and 57 packages by the U. S. mail.

RICE AND BRAN SHIPMENTS.

During the month 31,397 bags of Japanese rice, 5 bags of Chinese rice and 2071 bags of Japanese beans arrived at the port. All of these shipments were carefully examined and were found free from pests.

PESTS INTERCEPTED.

Twenty-five packages of fruit and two packages of vegetables were found in the baggage of passengers and immigrants from foreign countries, all of which were destroyed as contraband. One hundred bags of corn from Manchuria were found infested with the common rice weevil and were fumigated with carbon bisulphide before delivery. Forty-two crates of California peaches were seized and destroyed, as they were badly infested with the larvae of the peach moth. One package of plants from New York was found infested with the citrus mealybug and was fumigated before delivery. Three baskets of sweet potatoes from China were infested with the sweet potato weevil and sweet potato moth and were destroyed by burning. A package of taro from the Philippines came through the mail and was returned to the shipper under the ruling of the Federal horticultural law.

BENEFICIAL INSECTS.

During the month 4200 parasites were liberated in various places. They consist of 1000 *Opius humilis* for the Mediterranean fruit fly, 2000 were the three species of hornfly parasites and 1200 were parasites of the pupa of the fruit fly and were liberated in a cucumber field to ascertain if they will attack the pupae of the melon fly. On August 11 I received three samples of ripe coffee berries from the Kona district, Hawaii, for the purpose of ascertaining how far the *Opius* parasite has spread. These samples were from Kaawaloa, Kealakekua, Kiloa and Wai-panaula. From all of them was reared *Opius humilis*, the African parasite. From the Kaawaloa lot we were agreeably surprised to rear the Australian *Opius* (*Biachasma tryoni*). This species was liberated under a tent in the Kona section at Honau-nau on June 12, 1913, and up to its appearance this month had not been observed.

HILO INSPECTION.

Brother M. Newell reports the arrival of eight steamers and two sailing vessels at the port of Hilo. Five steamers brought

vegetable matter, consisting of 271 lots and 3252 packages, all of which were passed as free from pests.

INTER-ISLAND INSPECTION.

During the month of August, 61 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	86 packages
Taro	776 "
Fruit	14 "
Vegetables	16 "
Total passed	892 "

The following packages were refused shipment on account of infestation or of having objectionable soil attached to the plants:

Plants	14 packages
Fruit	26 "
Total refused	40 "

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, August 26, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I have the honor to submit as follows the report of the Division of Forestry for August, 1914:

FOREST RESERVE MATTERS.

On August 19 Governor L. E. Pinkham and members of the Board of Agriculture and Forestry held a public hearing at the office of the board to consider setting apart certain forest land in the districts of Kipahulu and Kaupo, Maui, as the Kipahulu Forest Reserve. The object of this reserve is to insure protection of the forest on the watersheds of important streams. The total area is 10,600 acres, of which 4600 acres is government land. No opposition developing, Governor Pinkham on August 20 signed a proclamation formally creating the reserve.

At the same hearing there was also considered the setting apart of three blocks of government land along the Volcano road above Glenwood, O'laa, Hawaii, that has never been taken up for homesteading. The object is to preserve as a forest park an accessible section of the native Hawaiian forest in its primitive condition.

The block of forest above Glenwood contains 374 acres. With it is included the seven and a half acres grove of koa trees at 29 miles and the narrow strips along the Volcano road between 18 and 24 miles, reserved when the road was built to protect the forest for scenic reasons. The area of the strips, now included as Section C of the O'laa Forest Park, is 150 acres, making the area of the reserve, as a whole, 531 acres.

The forest strips lying between 13 and 18 miles were not included, for the reason that the forest on them has almost entirely disappeared. This practically constitutes a recommendation to the Land Commissioner to dispose of these strips, under the law, as agricultural land.

The Kipahulu Forest Reserve is No. 36 in the chain of Hawaiian forest reserves. With the exception of two government lands on Oahu—Mokuleia on the Waianae hills and Hauula in Koolauloa—it practically rounds out the system and completes the reservation of the areas of forest needed for the protection of the watersheds of the Territory.

The O'laa Forest Park Reserve (No. 37) is included with the forest reserves largely for administrative purposes. It is set apart for its scientific interest and scenic value, rather than for strictly economic reasons.

The total area of the thirty-seven forest reserves in Hawaii now stands at 798,214 acres. Of this, 546,222 acres, 68 per cent, is land owned by the Territory.

The blocking out and technical reservation of the forest reserve system in Hawaii is practically accomplished. The problem now and for the future is how to manage these forests so that they shall be of the greatest possible service to the people of the islands.

Forest Fencing.

An inspection of the fencing along the government trail crossing the Lualualei Forest Reserve, Waianae, Oahu, was made by me on August 6. About half the posts were then in place. The work was progressing satisfactorily.

On the same day while at Waianae, I officially notified a squatter now making use of a portion of the Waianae Forest Reserve, to move his fence back to the proper boundary of his own lot.

Early in the month the final shipment of material was made

from Honolulu for the Waiaha Spring Forest Reserve fence in North Kona, Hawaii.

Issuance of a Mountain House Permit.

During the month, under authority given by the board at a meeting held on July 22, 1914, I drew up a form of permit granting to Mr. A. M. Brown the privilege of using a small portion of the Kula Forest Reserve on Maui for a mountain house and outing camp. In return for this privilege to use the land, Mr. Brown agrees to do certain tree planting on the upper slopes of Mt. Haleakala, particularly with conifers—pines, spruces and firs—from the temperate zone, which the board wishes to try out at that elevation. The permit is for a five-year period and is non-transferable.

FENCE POST INVESTIGATION.

Through a coöperative arrangement between the Division of Forestry and the College of Hawaii, a test of locally-grown eucalypts is about to be made on the college farm in Manoa Valley, where fenceposts cut from selected trees in the Tantalus forest will be tried out under the personal supervision of Prof. F. G. Krauss, superintendent of the farm. The species to be used are *E. robusta*, *E. globulus*, *E. citriodora*, *E. cornuta* and *E. calophylla*.

The felling and cutting-up of the trees will be done by Division of Forestry men; the hauling and setting of the posts by the college. From time to time statements of the progress of the study will be made by Prof. Krauss and published in the Hawaiian Forester and Agriculturist. As the trees from which the posts are cut are about thirty years old, these tests ought to be of value to all owners of eucalyptus groves in Hawaii.

ROUTINE MATTERS.

In addition to the usual routine work of the month I have, as far as possible, been rounding up all outstanding matters, so as to have no loose ends when I leave the Territory on August 26 to go to my new field of work at Cornell University. A series of notes and memoranda have been prepared that will enable my successor to get in touch at once with all current work. In the meantime, until a new superintendent of forestry is appointed, Mr. David Haughs, forest nurseryman, will attend to routine work and as usual carry on the activities of the section of forest planting.

I am leaving with the president of the board a report covering the work of the Division of Forestry from January 1, 1913, to August 31, 1914, which I suggest be included in the biennial

report of the board to the next Legislature. In it, after recounting briefly the happenings of the last twenty months, I have summarized what I feel to have been the important accomplishments of the Division of Forestry during the past decade, with certain recommendations for the future. I believe the suggestions there made are pertinent and worthy of adoption.

In concluding my work as superintendent of forestry and chief fire warden of Hawaii, I wish to express to the board my cordial appreciation of the support which the forest work has always received from the several commissioners, past and present. On very many accounts I go away from the Territory with regret. I trust I may still find many occasions to be of service in Hawaiian affairs. For wherever I may be located I shall always look back with alolia to my ten years of service in Hawaii Nei.

Very respectfully,

RALPH S. HOSMER,
Superintendent of Forestry.

REPORT OF FOREST NURSERYMAN.

Honolulu, August 31, 1914.

R. S. Hosmer, Superintendent of Forestry.

Dear Sir:—I herewith submit a report of the principal work done during the month of August:

Nursery.

Distribution of Plants.

	In Boxes Transplanted.	Pot Grown.	Total.
Sold	450	87	537
Gratis .....	...	1575	1575
	<hr/> 450	<hr/> 1662	<hr/> 2112

Collections—Government Realizations.

On account of plants sold.....	\$ 8.85
Rent of building, Nursery grounds.....	35.00
Half of cost of fence wire, Nahiku Homesteads.....	11.15
Total	<hr/> \$55.00

Preservation of Forest Reserves.

The sum of \$125 has been deposited with the Treasurer of the Territory as a special fund for the use of the Board of Agriculture and Forestry, collected as follows:

Rent of premises at Half-way House, Tantalus, at \$10 per month, April 1 to August 31, 1914.....	\$ 50.00
For use of land, Palolo Valley, April 1 to Sept. 30, 1914	10.00
For use of land gathering ti leaf, Pauoa Valley, April 1 to September 30, 1914.....	25.00
Permit to cut grass, Makiki forest, at \$20 per month, July and August	40.00
Total	\$125.00

Tantalus Forest.

In accordance with an agreement between the Division of Forestry and the College of Hawaii, a number of trees have been cut and split into posts, the species being *Eucalyptus robusta*, *E. citriodora*, *E. calophylla*, *E. cornuta* and *E. globulus*. The college has agreed to test and record the durability of the different species in regard to their value as fenceposts. Two laborers were employed by us to do the cutting and splitting, and the college agreed to do the carting.

Makiki Station.

The work at this station has been principally routine and consisted of preparing and sterilizing soil, transplanting seedlings and so forth.

Honolulu Watershed Planting.

The planting of trees in the neighborhood of Sugar Loaf and Round Top is progressing and we will be able now, with the help of six additional men, to make good progress in planting the ridges and valleys lying between Round Top and the Tantalus forest. The trees already planted are doing very well and will very soon be showing above the grass and guava bushes.

Advice and Assistance.

The following in the number of requests for advice and assistance: Calls made in and around the city, 6; by telephone, 5; by letter, 6; at Nursery, 8. Total, 25.

Forest Fences.

The writer paid a visit to the Lualualei Forest Reserve at Wai-anae for the purpose of examining the fence just completed by J. K. Luka. The fence consists of two lines built across the reserve and running along both sides of the trail leading over Kolekole Pass. After making a thorough examination I found that the fence had been substantially built and the work done according to the plans and specifications.

The repairs to the forest reserve fence running along the mauka boundary of the Lualualei homesteads were also examined and found satisfactory. The latter were under the supervision of Mr. Alike Dowsett.

Very respectfully,

DAVID HUGHES,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, September 16, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during the month of August, 1914, is submitted:

A comparison of the amounts paid per million gallons per 24 hours for government water under the various water licenses, has revealed the fact that there exists a wide variation in the prices paid under, apparently, similar conditions of cost of water development and application.

The data at hand cover most of the larger ditches on Kauai and Maui, and as a large part of these water license agreements terminate within the next ten years, these data should be carefully studied previous to the leasing of future water rights.

The investigation of the discharge of all ditches diverting government water is now being carried on, and it is anticipated that sufficient data will be available, when needed, to allow for an intelligent estimate of the amount of water furnished under each lease.

OAHU.

The coöperative experimental work with the H. S. P. A. Experimental Sub-station at Waipio was well started by the installation of three permanent weirs on the two main ditches which serve the greater part of the fields. These three weirs in connection with the Venturi meter at the source of supply will register the amounts furnished to and the amounts lost by seepage and

evaporation, in the two main ditches. Two steel portable weirs have been completed to make temporary measurements in the level ditches, which should show the losses incurred in this type of ditch. The actual hydrometric work will be undertaken during September and October.

Two water utilization and power investigations were started on the Kaluanui, Punaluu and Waihee watersheds.

Routine stream and rain-gaging operations and maintenance were carried on during the month, including hydrometric work in connection with the water supplies being investigated in connection with Honolulu's water supply.

The rainfall during the month continued above the average for this time of the year, in the catchment areas along the Koolau mountain range and on the windward coast. Rather exceptionally dry conditions prevailed between the Koolau and Waianae ranges and on the leeward coasts.

KAUAI.

Kauai reports that excessive rainfall conditions continue to prevail over most of the island, especially along the windward side.

Practically the entire month was used on routine stream and rainfall measurement operations in connection with the new stations recently established. A reconnaissance was made of the North Wailua and east branch of the North Wailua Stream to determine the materials needed for the new proposed clock register stations on these streams, the installation of which will put practically all government-owned water on Kauai under investigation.

A special series of measurements was made in connection with the Lihue Ice & Electric Power Co. in connection with turbine power tests.

MAUI.

During the month routine stream and rainfall measurements were made at 30 stream-gaging stations and four mountain rainfall measurement stations. The large rain gage maintained at the 1500-foot level in the Waihee Valley was visited. This gage has a capacity of 300 inches and during the period April 29 to September 1 collected 258 inches of rainfall, or a mean of 64.5 inches per month.

A section of the Honolua ditch was rated and a rating table furnished to the Honolua Ranch Co. to be used in making tests of the power plant now being established.

HAWAII.

Heavy rainfall in the vicinity of Hilo and Kamuela prevented further coöperative work for the Attorney General's department.

SEPTEMBER PLANS.

Oahu.

H. S. P. A. Experimental Station cooperative work will be carried on.

The investigation in connection with Honolulu's water supply will be extended.

Cooperative stream-measurement work for the U. S. Army, the Wahiawa Water Co., the Kahuku Plantation Co., the Laie Plantation Co., etc., will be done.

The special utilization investigations in connection with the Waihee and Punaluu streams will be carried forward.

Kauai.

Stevens clock registers will be established on the North Wailua and east branch of the North Wailua streams.

Maui.

Stream and rainfall-measurement work and general maintenance work will be done. An effort will be made to secure sufficient measurements at all new stations to warrant good ratings of these streams during the present year.

Hawaii.

Should weather conditions permit, further investigation work will be done for the Attorney General's Department in the vicinity of Hilo and Kamuela.

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

RHODES GRASS AND ITS INTRODUCTION INTO THE WEST INDIES.

Rhodes grass is a useful fodder plant known botanically as *Chloris Gayana*. It is a native of tropical Africa, but has been introduced into Australia and various other parts of the world. Towards the end of last year seeds of this fodder plant were imported into Montserrat, where, owing to its drought-resisting powers, it was thought that the plant would be an acquisition in the matter of providing food for live stock. Shortly afterwards, the question arose as to whether the introduction of a new species might not give rise to difficulties in regard to the control of its

spread into places where it was not required. An examination of all the more recent literature dealing with the economic value of this grass leaves little room for doubting its great usefulness, but caution must be exercised to keep it under experimental control at first until it is seen what its behavior is going to be under a new environment.

Before proceeding to deal with the economic characteristics of the plant, it may prove interesting first of all to say a few words about the distribution of the different species of this interesting genus. According to *Index Kewensis*, there are some species of *Chloris* which are indigenous to different parts of the tropics, but chiefly Africa. There are nine species and several varieties of the genus indigenous to Australia. In the West, there are several indigenous to tropical America, whilst *C. brevigluma* is a native of Cuba, and what is more interesting, *C. propinqua* is indigenous to Guadeloupe. In the present connection it is worth noting that the well-known West Indian grass *Cynodon Dactylon* has been described on one or two occasions wrongly as *C. maritima*.

According to the Kew Bulletin (1908, No. 1), most of the Australian species are excellent forage grasses, having a high reputation with stock owners, who know them as "Blue star grass" and "Dog's tooth star grass," as well as by other popular names. But according to the Queensland Agricultural Journal (Vol. XXVI, p. 164), it is the introduced species, *Chloris Gayana*, that has given most satisfaction. This grass has not only survived, but has grown luxuriantly through the long dry summer months, and has been regarded in many parts as a sort of nursery crop for any animals lacking in condition. In one place, the seed of this grass was sown at the rate of 2 lbs. to the acre together with 2 lbs. of *Paspalum dilatatum*—the well-known fodder grass which is gradually being ousted by *C. Gayana*. It is stated that Rhodes grass, unlike other quick-growing ones, is relished at all stages of development by stock, and does not deleteriously affect dairy products. It has proved a wonderful grass for resisting drought, and will grow and remain green when all other grasses, natural and artificial, are burnt up. It requires a less rich soil than *Paspalum dilatatum*. When harvested, it has an aroma that is not easily defined—very strong, but not unpleasant. It is said to make good chaff, especially when mixed with lucerne. In one trial, the yield per acre of hay was at the rate of 5 tons 7 cwt.

The comparative feeding values of the two grasses are discussed in the Agricultural Gazette of New South Wales (Vol. XXII, p. 238), where it is regarded as established that Rhodes grass has a greater nutritive value than *Paspalum* grass, being richer in protein and poorer in crude fiber. In this account it is mentioned incidentally that *C. Gayana* has a creeping stem which roots at the joints, but in a thick stand the stems are upright. This power to

perennate must be borne in mind in any considerations bearing upon the danger of this plant in the West Indies as a weed. At the same time the undoubted nutritive value and great drought-resistant powers of the grass are not likely to make its spread undesirable on stock farms.

In Florida and the intermediate region of America a good hay grass has long been a desideratum. It is stated in the Annual Reports of the Department of Agriculture of the United States, 1912, that Rhodes grass, secured from Africa, promises practically to solve the hay question for that portion of the South. Field tests of Rhodes grass are being conducted in Florida in order to determine its climatic and soil requirements and the yield of hay which may be expected. One field of 20 acres has been established near Brooksville, from which results on a commercial scale are expected. This plant has also been introduced into Arizona, where it promises to give much satisfaction, and it is understood that it is also being tried in Porto Rico. The results of these experiments will be awaited with interest.

Whilst discussing forage crops, it may not be out of place to conclude this article with a few remarks concerning other drought-resisting grasses, which have attracted much attention during the last few years. In the Monthly Bulletin of Agricultural Intelligence and Plant Diseases (June, 1913), a note says that Teff (*Eragrostis abyssinica*) was introduced into the Transvaal in 1903, and has since proved itself a complete success, and is fast becoming a staple hay crop throughout civilized Africa, its qualities being palatability, high nutritive value, heavy yield, rapid growth, drought resistance, and ability to smother weeds. Another well-known grass, namely, Soudan grass (*Andropogon halepensis*), is reported in the same journal for July, 1913, to have been imported into the United States from Soudan in 1909. This grass yields well, especially in dry seasons, and the fodder is much appreciated by stock.* The last grass to which we invite the reader's attention is known as Elephant grass or Napier's fodder (*Pennisetum purpureum*). The cultivation of this plant is described in the Monthly Bulletin of Agricultural Intelligence and Plant Diseases (November, 1913). It has proved a very drought-resistant and heavy-yielding fodder crop in Rhodesia. Owing to its succulent character and coarseness of stem it does not make good hay, but as green fodder for stall-fed animals, it can hardly be excelled by any other crop in Rhodesia. In damp situations, where water is liable to stand, it wilts, and is then best replaced by *Paspalum*, or

* A word of caution, however, is here necessary. *Andropogon halepensis* is synonymous with *Sorghum halepense* (Johnson grass)—a plant which when introduced into many places has eventually become for a time uncontrollable as a weed, and has only been eradicated after much difficulty and expense. Drought-resisting grasses are not always unmixed blessings.

by Rhodes grass. In dry situations or in cold localities, it is much to be preferred to sugar cane, and will give better results both in weight of fodder and in food value.—The Agricultural News.

THE SPELLING OF "COCONUT."

The Editor of the Tropical Agriculturist.

Dear Sir:—The following from the Ceylon Morning Leader will prove of interest to your readers:—"The Spelling of 'Coconut.'—Sir Everard im Thurn, speaking at the Royal Horticultural Society, said the nut now known as 'coconut' was similar to the face of a monkey, and so the Spanish word 'coco,' meaning a grin or grimace, was attached to it. When Dr. Johnson was writing his famous dictionary he had an article on the 'Coconut,' but a careless proofreader passed a mistake in the spelling of the word, the compositor having inserted an 'a' and the word appeared as 'cocoanut.' This spelling became general, but the nuts are now known as 'coconuts,' 'kokernuts,' and 'kokers.'"

The present universal spelling "coconut" is rightly claimed to have originated with the Tropical Agriculturist, and the general adoption of the spelling, dropping the extra "a," has materially assisted in establishing the spelling in newspapers and magazines all the world over—the more recent but illogical American "kokers" and "kokernuts" notwithstanding; as this form not only gives a longer sound to the word than is otherwise given it, but would appear to the average reader an entirely new product.

But there are other relative forms of spellings which are often confusing and misleading—not variations regarding one article, but various articles being known by similar names. This fact deserves the serious attention of experts, who should agree to adopt names that would avert confusion.

I refer to the "Cocoa" as still to be seen in the writings of an older generation before *nut* in referring to the Coconut (*Cocos nucifera*); "Cocoa" and "Cacao" meaning the "Chocolate fruit"—as is often heard in the streets of Colombo and occasionally at Peradeniya on passenger days—(*Thebroma, Cacao*); and "Coca" (*Erythroxylon coca*).

Mr. O. W. Barrett, I think, it was who in the course of a treatise on the subject stated that in dealing with *Cacao* from an agricultural and botanical point of view he would leave the manufacturer to deal with "Cocoa"—indicating the origin of the irregular form.

Now that we have "Coconut" fixed and in universal use, and "Coca" not being likely to change, will it not be more in keeping with science to do away with "Cocoa" altogether and substitute the more correct form "Cacao," which will leave three articles that are at present often confused with one another, on separate

forms of spelling and pronunciation, with the least possibility of confusion?

I suggest the Tropical Agriculturist give the lead in adopting *Cacao* as the proper spelling, so that we may have:

Cacao (*Theobroma, cacao*),

Coca (*Erythroxylon coca*),

Coconut (*Cocos nucifera*).

Yours faithfully,

J. S. DE SILVA.

[Our correspondent is not quite correct in stating that *Coconut* is the universal spelling. Probably the vast majority of people spell the word with an *a*. Turning up the Stores List we find "Cocoanut biscuits," "Cocoanut oil"; and confectioners and traders throughout the United Kingdom would spell the word in the same way. Again, while *Coconut* is probably more correct, *Cocoanut* is certainly not incorrect. Thus the Century Dictionary after an exhaustive explanation of the origin of the two forms of spelling adopts *Cocoanut* in the text. Nor are we prepared to scrape the word *Cocoa* especially as *Cacao* is generally mispronounced. Indeed, if we are to come to origins, the ultimate criterion after all of what is correct, *coconut*, *cocoanut*, *cocoa*, *cacao* would all go overboard as designations of trees. The coconut palm was at one time called the *cocoa-tree*; *cocoa* or *cacao*, whichever is preferred, the *chocolate-tree*, and is so called now in some countries.—Ed. T. A.] — Tropical Agriculturist (Ceylon).

BANANAS.

The experiments of R. G. Bartlett in Ceylon, in the way of manuring bananas, show that potash is the essential portion of a banana manure, manures wanting in this agent being of little or no good. Mr. Bartlett advocates the manuring of virgin land. The manure he found to give the best results financially consisted of 4 lb. of dried blood, 2 lb. sulphate of potash, and 2½ lb. superphosphate per stool.—*Health of India*.

PASSING OF THE HORSE.

"The horse (says the *Pinang Gazette*) has played an important part in the world's affairs, and from a purely sentimental point of view, it is difficult to regard his passing without some feeling of regret. But sentiment has to be stifled in these commonplace days, and it is a cold irrefutable fact that the introduction of machine power is so much appreciated that it will soon be time to consider whether horse traction, with its incurable, objectionable conditions attaching it, should be permitted at all in cities and

towns. We in Pinang have no reason to deplore the passing of the horse," to which we would add, neither should the growers of coconuts. The passing of the horse is creating new demands from old-established industries for substitutes for horsehair. Incidentally, coconut fiber is fast taking the place of horsehair for the stuffing of chairs, omnibus, railway and other seatings, and bedding mattresses, and is found to be a cleaner and more wholesome, germ-proof article, with equal resiliency.—*Tropical Mail*.

UNRECOGNIZED LUXURIES.

It is astonishing how little is known in England of any fruits outside a very limited selection. Yet there are a large number of excellent fruits which, if the public taste could only become familiarized with them, would become popular and important items in tropical imports.

There are few fruits which surpass in exquisite flavor the mango, such as may be got in Bombay and other parts of the eastern tropics. Difficulties of carriage of this rich, juicy fruit have perhaps chiefly interfered with its introduction into European markets, but once let its merits be appreciated by the public and these difficulties would not prove insuperable.

The mangosteen, again, is a most delicately flavored fruit—the cherimoyer of Peru, a species of anona, as is also another species of the same fruit, the sugar apple.

The avocado, or alligator pear, which grows in many ranches in tropical America—the chico or sapodilla; the guava; the roselle and the papaw (papaya), a large fruit not unlike a melon.

All these and many other fruits, varied in character and flavor, are well worthy of attention on the part of the European gourmet.

Bananas are every year more in evidence in the London markets, and will grow still more in public estimation as their mode of ripening becomes better understood. Today they are only too often eaten in a half-ripe condition, their appearance when perfectly ripe being misunderstood for one of decay.—*Tropical Mail*.

THE FOOD OF THE PEOPLE.

It would be difficult to imagine a foundation for investment more sure, more permanent and more steadily remunerative than that of the food of the people. Under pressure of urgent necessity or misfortune many articles of daily use might be dispensed with, but food is indispensable. And food is one of the chief products of the tropics in which investment is invited—butter, lard, confectionery, cocoa, coffee, fruits, etc.

Second only in importance to food are a number of articles intimately associated with our daily life, which may almost be

called necessities of civilization. Soap, candles, mats, mattresses, ropes, yarns, food for our cattle, stuffing for furniture and other things. All these are manufactured, in the best and yet cheapest form, from products of these same countries.—*Tropical Mail*.

"In China," says the Barbados Standard, "a man who killed his father has been executed, and along with him his schoolmaster, for not having taught him better!"

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THE HAWAIIAN FORESTER AGRICULTURIST

VOL. XI.

NOVEMBER, 1914.

No. 11

An introduction to some of the rare scenic resources of the Island of Oahu is furnished in the illustrated account, in this number, by Professor MacCaughey, of a biological expedition over the Koolau mountains.

Gratification will be felt by all who have taken an interest in the fruit fly control campaign on reading the report of the investigations made by Mr. Giffard and Dr. Back of the extent to which the Silvestri parasites have become self-colonized in the coffee and fruit fields of Kona. It is pleasing in itself to know that the expedition of the Italian scientist to Africa last year has not gone for naught, through failure of the first part of the problem which might have happened by the dying of the original parasites he brought here, but the keenest satisfaction is found in the evidence now presented that not only have the beneficial insects lived to propagate their kind, but their progeny appears to be doing effective work in keeping down the pest. Mr. Giffard's observation that the infestation of coffee berries in Kona is now fifty per cent less than a year ago is most encouraging testimony.

Besides the usual record of pests kept out of the Territory, the report of the superintendent of entomology for September contains encouraging data on fruit fly control.

Nearly thirty thousand plants distributed in one month, to the general public and corporations, as reported for September by Mr. Haughs, form a record for the division of forestry which should be a matter of pride to the entire Territory.

Hint of the possibility of a billion-dollar reservoir in the region of Kahuku, Oahu, given in the report of the superintendent of hydrography for September, is just one inkling of what the scientific measurement, control and utilization of the water resources of these Islands mean to their industrial, commercial and social development.

DIVISION OF ENTOMOLOGY.

Honolulu, September 30, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—I respectfully submit my report of the work performed by the Division of Entomology for the month of September, 1914, as follows:

During the month 32 vessels arrived at the port of Honolulu, of which 18 carried vegetable matter and one vessel moulding sand.

Disposal.	Lots.	Parcels.
Passed as free from pests.....	1444	37,157
Fumigated	1	6
Burned	12	27
Returned	1	1
Total inspected	1458	37,191

Of these packages, 36,996 packages arrived as freight, 110 packages as baggage of passengers and immigrants, and 85 packages through the postoffice.

RICE AND BEAN SHIPMENTS.

During the month 18,044 bags of rice and 1786 bags of beans arrived from Japan, and after careful inspection were passed for delivery.

PESTS INTERCEPTED.

Nine packages of fruit and one package of vegetables were found in the baggage of passengers and immigrants from foreign countries; these, being contraband, were destroyed. Six bay trees arriving from California were found slightly infested with a leaf-curling *Psyllid*. The plants were fumigated and all infested leaves were removed before delivery. Sixteen crates of California peaches were found infested with peach-worm *Anarsia linatella* and were destroyed by burning. Three packages of plants arrived by the Ventura from Sydney, N. S. W., which were free from pests, but the soil about them was removed before delivery. One package of plants arrived from British Columbia by parcel post and was returned to sender as being prohibited under the postal regulations of the federal horticultural board.

BENEFICIAL INSECTS.

During the month 8000 parasites of fruit fly and horn fly were liberated. Of these, 3000 horn fly parasites were sent to Maui

and 2700 horn fly parasites, as well as 500 *Opius* for the fruit fly, were liberated on the windward side of Oahu; 400 *Opius* were liberated at Aiea and 800 *Chalcids* and 600 *Galesus silvestrii* were liberated in squash fields in the lowlands.

From the small lot of Australian parasites, *Diachasma tryoni*, reared from coffee berries from the Kona district we have been able to rear only male parasites in the insectary. The same experience was had when Silvestri first brought them here. Nevertheless, the fact that we have been able to rear the parasite from Kona material indicates that the parasite has established itself there.

HILLO INSPECTION.

Brother M. Newell of Hilo reports the arrival of ten steamers and one sailing vessel at that port. Six steamers brought vegetable matter, consisting of 208 lots and 3479 packages, all of which were passed as free from pests. The steamer *Kiyo Maru* also arrived direct from Japan, bringing 7395 bags of rice, 193 bags of beans, 15 bags of peas and 25 bags of peanuts, which shipments were found to be free from pests of any kind.

STORE INFESTATION.

During the month E. O. Hall & Son called my attention to a pest destroying the soft hair brushes in their store. I immediately investigated the trouble and found the brushes attacked by the buffalo carpet beetle *Anthrenus scrophulariae*, a very common pest in houses on the mainland, generally attacking rugs, carpets, furs, etc. I advised them to send all their infested packages to the fumigating room on the Alakea dock for treatment, which they gladly did. After a forty-eight-hour fumigation, which penetrated every box and crevice, we found all the pests dead.

INTER-ISLAND INSPECTION.

During the month of September 63 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	62 packages
Taro	985 bags
Vegetables	50 packages

Total passed1097 “

The following packages were refused shipment on account of infestation or of having objectionable soil attached to the plants:

Plants	8 packages
Fruit	28 "
	<hr/>
Total refused	36 "

Respectfully submitted,

E. M. EHRHORN,
Superintendent of Entomology.

DIVISION OF FORESTRY.

Honolulu, September 30, 1914.

Albert Waterhouse, Esq., Acting President and Executive Officer,
Board of Agriculture and Forestry, Honolulu.

Dear Sir:—The following report gives the principal work done during the month of September, 1914:

NURSERY.

Distribution of Plants.

	In Seed Boxes.	In Boxes Transplanted.	Pot Grown.	Total.
Sold		150	519	669
Gratis	8500	1415	1713	11,628
	8500	1565	2232	12,297

COLLECTIONS.

Collections on account of plants sold amounted to.....	\$11.15
Rent of building, Nursery grounds, for month of August..	35.00
	<hr/>
	\$46.15

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The distribution of plants under this heading amounted to 17,000 in seed boxes.

MAKIKI STATION.

The men at this station have been busy getting up a stock of trees for the coming planting season and Arbor Day. We have now in stock large numbers of the species that are in demand.

HONOLULU WATERSHED PLANTING.

The work connected with the planting of the waste land lying between Round Top hill and Tantalus forest is progressing, and a large number of holes for trees have been dug. All of the area first planted has been gone over and the trees cleared of weeds. The total number of trees planted during the month amounted to 711 (koa 349 and kukui 362). More planting will be done during October.

TREE PLANTING.

Moloaa Forest Reserve, Kauai.

From the 24th to the 27th of September the writer was away on a trip to Kauai. The trip was made for the purpose of completing arrangements in regard to the planting of tree seed on the Moloaa forest reserve. An examination of the tract was made and instructions given to Mr. Kaina D. Lovell, who is to have charge of the planting, how to proceed with the work. A commencement will be made on October 1 with four men. The conditions at this time are very favorable to the direct planting of seed. The amount to be spent on this work is not to exceed \$500.

Koolau Forest Reserve, Maui.

Arrangements have been completed with Mr. W. A. Anderson, Nahiku, in regard to the planting of a double line of trees along the boundary fence between the Koolau forest reserve and the Nahiku homesteads. Trees for the purpose will be forwarded from our nursery here about the end of October. The amount to be spent is not to exceed \$200.

Waihou Spring Forest Reserve, Near Olinda, Maui.

The tree planting on the reserve will be in charge of Mr. L. von Tempisky, who has agreed to transplant and plant out the seedlings. The trees will be shipped from the nursery here in seed boxes to Paia. From Paia Mr. von Tempisky will cart them to the reserve. The trees will be forwarded about the beginning of November. The amount to be spent is not to exceed \$200.

Pupukea Forest Reserve, Oahu.

Another tree-planting proposition which is pending and will be arranged for during October is the Pupukea forest reserve, on this island. The writer will make a trip to Pupukea in a few days and draw up a planting plan for the reserve, for which an allotment of \$200 has been made.

ARBOR DAY.

Arrangements are being made, as in former years, to observe Arbor Day, and a large supply of trees is on hand for that purpose. The superintendent of public instruction has been notified of the different species available, and he is sending out communications to the principals of all the schools in the Territory. Notices to the general public will be published in the various papers, stating the number of trees each applicant will be entitled to, also the names of the species available. Arbor Day takes place on November 20, according to the Governor's proclamation.

ADVICE AND ASSISTANCE.

The writer has made the following calls and answered questions verbally and by letter as follows:

Calls in and around city, 5; by telephone, 4; at nursery, 6; by letter, 6.

Very respectfully,

DAVID HUGHES,
Acting Superintendent of Forestry and
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, October 15, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—The following report of operations of the Division of Hydrography for the month of September, 1914, is submitted:

STORM OF SEPTEMBER 22-27.

The heaviest storm for many years occurred on the islands of Kauai and Oahu on September 22 and 23. The storm broke with greatest intensity over Kauai, and evidently struck Oahu first in the vicinity of Kahuku, as the greatest floods occurred in that vicinity. Large floods occurred on all streams heading on the Koolau mountain range. From all available reports, while a great amount of rain fell on Molokai, Maui and Hawaii, the floods were of lesser intensity than on Kauai and Oahu. So far as the hydrographic work is concerned, little damage was done. No damage has been reported from Kauai and Maui. On Oahu the damage was small, being limited to the washing out and loss of six staff gages, the wrecking of a cableway, without the loss of the cable and car; and the ripping out of a concrete slab which

formed the control of the middle branch of the Malaekahana stream, near Kahuku. All of the equipment lost and damage done has been replaced and repaired at a low cost.

Lihue rain gages registered nearly 15 inches for the 24 hours ending September 27, a. m. On September 22 the Waihee rain gage registered 10.7 inches and the Hana rain gage registered 12.8 inches. The total rainfall for the month at Keanae was about 45.0 inches.

FLOOD MEASUREMENTS.

The September floods enabled the engineers on the islands of Kauai, Oahu and Maui to secure much needed flood measurements, on many streams; and the data obtained are of great value in determining the maximum run-off of streams. As a rule floods in Hawaiian streams run off so rapidly that it is rare that an engineer can reach the station in time to secure measurements. The September floods were sustained sufficiently long to enable men to get to the stations before these subsided.

The cooperative stations constructed by the Kahuku and Laie plantations were established primarily to register the flood run-off of the streams in that vicinity. This information is desired to determine whether or not the construction of a billion-gallon storage project in that vicinity would be justified.

OAHU AND ADMINISTRATION.

During September four papers relative to hydrographic and conservation subjects were prepared.

One two-thousand-word memorandum was prepared for the Chamber of Commerce, which covered the general scope of the work, the work already accomplished, the work now in hand, and the results to be worked for.

A two-thousand-word article relative to the hydrographic work was prepared and mailed for publication in the 1915 Hawaiian Annual, at the request of Mr. Thos. G. Thrum.

A three-thousand-word article on Conservation was prepared and 50 lantern slides were made from photographs pertaining to this work were purchased. This article is to be read and the views shown to a gathering of Kauai people under the auspices of the Mokihana Club at Lihue, on October 16 or 17.

A three-thousand-word article relative to Hawaiian hydrographic and conservation conditions was written. This article will be presented at a conference of government engineers at Washington, D. C., in December, 1914.

A large amount of stream measurement work was accomplished. Fifty-two stream and ditch measurements were made and three rain gages were visited. Six staff gages were re-

place, one cable-way was re-erected and a considerable amount of general trail and stream bed clearing work was done.

The Kunawau spring in Honolulu was measured and found to be discharging about 720,000 gallons per 24 hours.

KAUAI.

The installation of a new continuous register on the North Wailua river, at an elevation of 650 feet above sea level, was completed on September 26. The new station was not damaged by the heavy flood of that date. The construction plant was moved to the new station site on the east branch of the North Wailua river and work was begun on the trail necessary to reach this station.

Sixteen rain-gaging stations were visited and 17 stream measurements were made.

MAUI.

Mr. Bailey spent 25 days in the field, visited 29 stream-gaging stations, and made 21 stream measurements. Several days were spent on clearing and repairing foot trails leading to stations.

The following tabulation shows the status of stations maintained:

NUMBER OF STREAM-GAGING STATIONS.

Island.	August 31.	Established	Discontinued	September 30.
		During Month.	During Month.	
Kauai	37	1	2	36
Oahu	51	0	1	50
Maui	43	0	1	42
Hawaii	1	0	0	1
Total	132	1	4	129

Very respectfully,

G. K. LARRISON,
Superintendent of Hydrography.

The best excelsior is made from basswood, or linden. Aspen and cottonwood, however, supply nearly half of the total amount manufactured.

The King of England has given permission to have a part of the royal estate placed at the disposal of the school of forestry at Cambridge University for purposes of experiment and demonstration.

THE KOOLAU MOUNTAINS BETWEEN WAHIAWA
AND KAHANA, OAHU.

By VAUGHAN MACCAGHEY, *College of Hawaii.*

Being a Report upon a College of Hawaii Biological Expedition,
December 16-18, 1912.

The purpose of this expedition was a biological reconnaissance of the rich and varied mountainous country lying between Wahiawa and Kahana. This region has been traversed by various civil and military expeditions, but has never received detailed



View of Kahana Valley from the Koolau pali.

biological consideration. It was hoped during the present trip to ascertain the general topographic and life conditions, preparatory to intensive surveys to be made later.

Prof. Bryan gave attention to the animal life, particularly the fresh water and arboreal molluscs; and to temperature records

of atmosphere, streams and pools, as related to the geographic distribution of *Metania*.

Prof. MacCaughy took barometric and anemometric observations; made a photographic record of the region traversed, and collected algae and liverworts.

Mr. Shaw collected spermatophytes, giving particular heed to Lobeliaceae. At 10:20 a. m., December 16, the party left Honolulu for Wahiawa, on Oahu Railway train.

At 12 m. the party left Wahiawa Station and started *mauka* along the main road running towards the Koolaus. The sky was clear, with cumulus clouds heaped along the main ridge of the Koolaus.

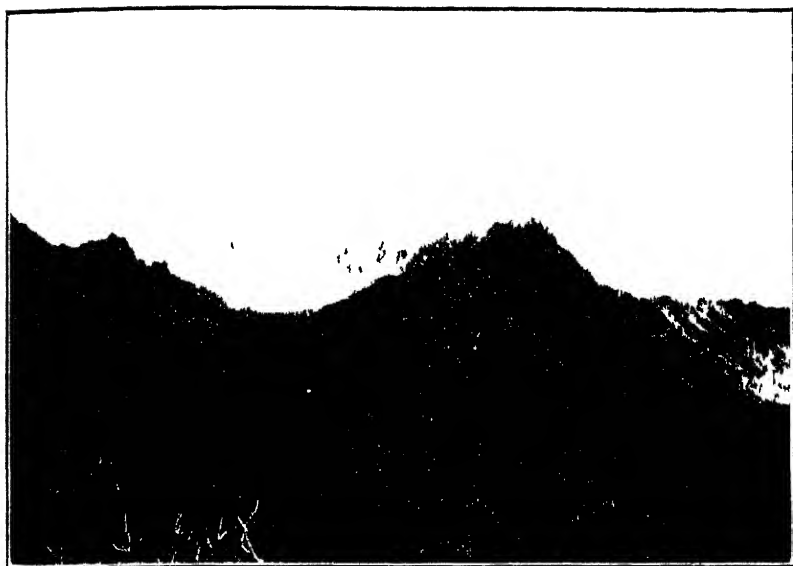
After proceeding along the road for a mile, we stopped and lunched. A pleasant breeze was blowing; the anemometer gave a reading of 880 feet in 2 minutes, or 440 feet per minute. The barometer showed an elevation of 1050 feet.

After lunch we proceeded *mauka*, striking the "headgates" trail at the end of the road, and following it. The army engineers have improved this trail by clearing it, and by making "corduroy" pathway over the most boggy places. Painted guide signs have been placed at suitable intervals. One of these signs, marked "To Kahana," is placed at a bifurcation in the trail—that to the right hand being cut, but not graded, and leading up towards the upper side of the valley; the other, leading downward towards the stream to the left, is both cut and graded, and is the "headgates trail," leading to the cabin at the intake.

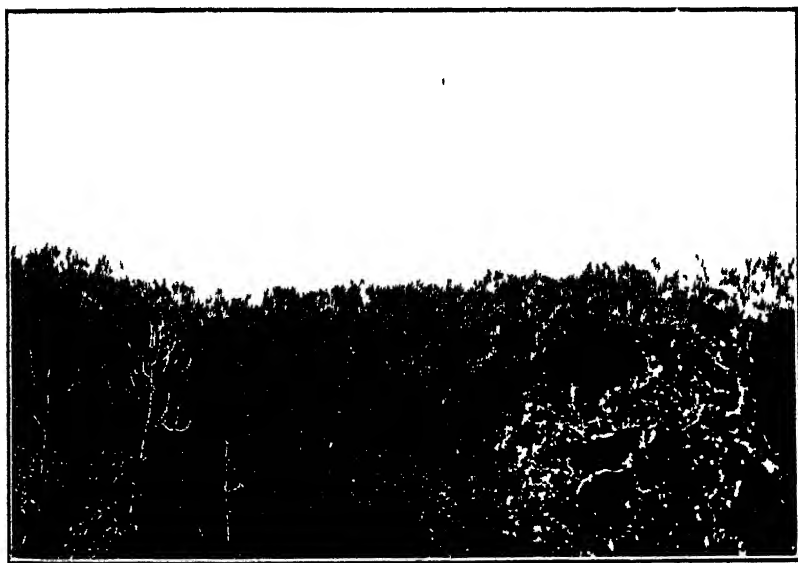
This fork in the trail is of considerable importance to the traveler, for at this fork one chooses between two trails up to the Kahana pali. The left-hand branch leads to the cabin, which affords shelter for the night. The grade is easy to the cabin, and the trail from the cabin to the pali consists of two hours' wading up a cold and rocky stream, and then a hard scramble up a steep and jungle-grown "hogback" ridge to the pali. The right-hand branch leads up to the ridge that bounds the valley to the right. To follow this ridge up the pali means much up and down travel, and no shelter at night.

We took the right-hand branch, and followed it along the ridge crest until 5 p. m. At this time we decided to pitch camp, and in order to find a suitable place near water, dropped down a side spur to the left. The point at which we left the main ridge to descend the side spur has an elevation of 2000 feet. We marked it with a conspicuous blaze (two crosses to the left). At this point, if we had known what lay ahead, we should not have descended at this place, for the next morning, after 1½ hours' travel on along the ridge, we came to an Army sign, "To water, 200 yards below the trail." If we had known of this camping place, we would have hastened to it.

However, we descended as before described, and after fifteen



View of the eroded Koolan peaks as seen from the Kahana pali.



View across the highly-eroded and densely-forested ridges of the
Kaukonahua region.

minutes discovered pools of water in a steep streamway. Nearby the pools was a magnificent *loulu* palm. We camped here, and named the place *Loulu Camp*. We collected firewood, made a sleeping place of saplings and palm leaves, ate supper, and slept under a warm and starlit sky. The early part of the night was moonlit. The weather remained ideal for our trip. The elevation of Camp Loulu is 1800 feet. The temperature of the pools of water was 60° F. In the morning we cleaned the litter out of the largest pool, and piled up the palm leaves that had proven so useful. We broke camp at 8:30 and climbed the spur, and continued *mauka* along the main ridge. The main criticism of this ridge trail is the numerous elevations and depressions, that soon prove tedious. Otherwise, the trail is well cut, and affords many magnificent views, on one hand, across Kaukonalaua Valley and, on the other, across Waikakalau, Pearl Harbor, Ewa and the Waianae Mountains.

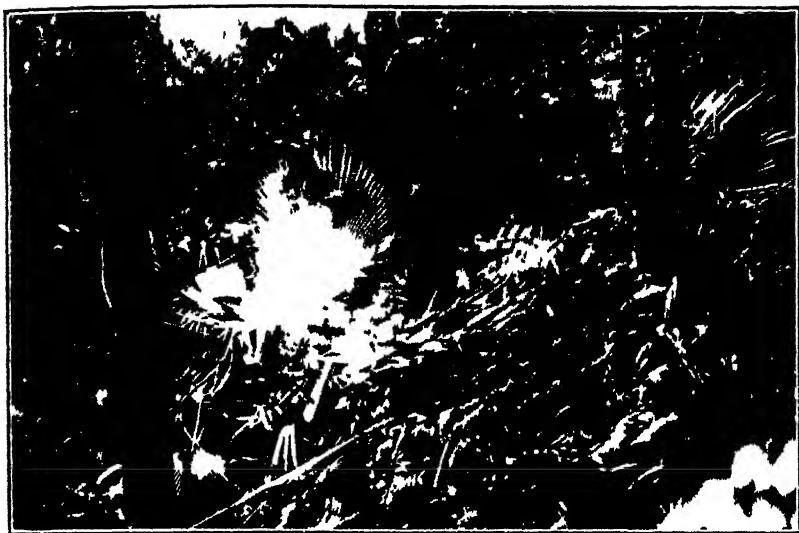
After 1½ hours' travel we reached the Army sign above referred to. At this point the ridge becomes somewhat steeper. At 10:40 a. m. we reached the summit, and gazed down into Kahana Valley, and across the intervening hills towards Kaeohe Bay and Mokapu Point. The summit knoll which we had attained has an elevation of 2500 feet; the air temperature was 68° F.; the soil temperature (4 inches down) was 64° F. The wind velocity was 1420 feet in 2 minutes, or 710 feet per minute. The wind appeared to be of average strength, judging from its "feeling."

We lunched on the summit, and then followed the trail, which leads to the left along the backbone of the Koolaus, and is plainly marked, "To Kahana," by an Army sign. On the next knoll is another sign, "To the Intake," but this refers to the same trail, and no confusion need be made. The trail continues along the summit for at least a quarter of a mile, and then turns sharply down a prominent ridge that leads precipitously down into Kahana Valley. This ridge is very steep, but the trail is well marked, and is easily followed.

At 2:30 we had dropped 2000 feet, and were at the pandanus grove at the foot of the ridge. This grove is 500 feet above sea level; the pools of water near it were 68° F. Upon reaching the Kahana Stream, Professors Bryan and MacCaughy began collecting aquatic material. Mr. Shaw leaving the party and planning to walk back to Honolulu that same night. He went as far as Heeia, and reached Honolulu the next morning.

We went more leisurely down stream, collecting at various points, and arriving at Kahana Station at 5 p. m. We remained over night at the residence of Mr. Leckenby.

Next morning, December 18, Professor Bryan continued his *Melania* investigations throughout the lower courses of the Kahana and Punaluu streams; Professor MacCaughy collected lit-



Camp Loulu, showing dense "rain forest" vegetation.

toral material, and procured photographs of *Colocasia* and *Xanthosoma*.

At noon we took the train to Kahuku, and from there to Honolulu, arriving at 5:30 p. m.

NEW USES FOR INDIA RUBBER.

India rubber is the Jacob, the supplanter, of the industrial world. Rubber hose dispossessed hose of leather, the rubber-covered golf ball drove out the "guttie," the motor banished the horse. No industry or profession but has shown rubber supplanting some time-honored object. Take, for example, the case of King David as chronicled in the first book of Kings. "David was old and stricken in years and they covered him with clothes, but he gat no heat." Then his servants got a young maid who lay in his bosom to warm him. This system presumably prevailed among elderly kings until 1850 or thereabouts, when india rubber in the form of hot water bottle supplanted the feminine heat supplied, and has done so to a degree, ever since.

Industrially it has insinuated itself everywhere, displacing wood, metals, fabrics and only rarely making a new and original use for its wonderfully adaptable self. It was its costliness only that kept it from further encroachment.

With rubber at a shilling or twenty-five cents a pound (and that is where it is said to be going), the great expansion in its

manufacture will be in the line of further and greater encroachment.

Let's afieid with fancy and picture its progress:

The growth that will come in automobile and motor truck tires has already been forecasted, but the impetus to be given to other established lines does not seem to be appreciated. All will grow greatly. The only obstacles are the increasing cost of labor—which is the most serious—and high prices for fabrics, solvents and ingredients.

INDIA RUBBER LEATHER.

In footwear of leather, rubber has already made itself a factor.

Aside from the cements used in channeling and filling, the rubber heel and sole have displaced quite a percentage of those made of leather. With low-priced, high-grade rubber, leather in soles for footwear, material for trunks, straps and a score of other uses, including machine belting and harnesses, is sure to give way to its more adaptable rival. As for shoe uppers, leather is used theoretically because of its porosity that allows heated air to escape and absorbs perspiration—this in spite of the fact that the leather is filled with oil and blacked and varnished. It is quite possible that a mixture of fiber and rubber will appear that will be cool, odorless and blackable.

As for patent leather, it is sure to be supplanted by a smooth, glossy-surfaced rubber product on a cloth backing that will not crack and will be far cheaper than the high-priced leather products. This will open a field in footwear, shopping bags, ladies' belts, etc., etc.

Indeed, wherever leather is used today rubber will soon prove a formidable rival.

INDIA RUBBER LUMBER.

Mats, matting and tiling of india rubber are already extensive factors in home, office and factory furnishing. But why not flooring of hard or semi-hard rubber? As has been proved in tests of tiling wear, it will outlast stone or wood. It can be made in any color. Certainly at the present price of hardwood flooring, with rubber at 25 cents a pound, it could compete. Nor would it need varnishing, waxing or oiling—simply polishing. It could easily be molded with a semi-hard lower side for nailing and be matched and furnished in strips of any length or width. It would be practically fireproof, and not inflammable as is varnish-covered wood, and would neither swell nor shrink, as it would be moisture-proof and vermin-proof. For a white-ant country it would be invaluable. In cabinet work, hard rubber veneers to imitate ebony, mahogany, bog oak or any of the darker woods

are easily made and the richest effects secured. For furniture, solid mahogany sideboards, tables and chairs may be superseded by those made of hard rubber.

In other words, hard rubber lumber is in sight—the lumber sawed, planed and turned as lumber is today and the sawdust not a waste product but molded into new lumber, and the furniture or panels or flooring after use returned to the mill that made them, and these, too, made into just as good hard rubber lumber as when first manufactured.

Better than rubber roofing will be the fiber and rubber shingles of the future. If the underwriters are fussy the fiber may be asbestos or the compounding ingredient infusorial earth.

Boat-builders (wooden boats) have trouble with their lumber. When hard rubber lumber is available they will rejoice. It will be hard on those who sell copper sheath or Anti-Teredo paints; for the busy water borer will not touch rubber.

Speaking of hard rubber lumber, who can say that a factory for turning it out will not one day be established in Singapore, to make boxes in which to ship rubber? The boxes, of course, to be sawed up into short vulcanite sheets for insulation work, once their duty as rubber carriers is finished. At least it would not be difficult to make wooden boxes with a thin coating of hard rubber vulcanized to the wood, forming a clean anti-sliver coating. Such boxes could easily be ventilated and should find use when empty.

Great European ports send to South America for Greenheart logs to build their docks, and a costly product it is. Iron columns covered with a thin film of hard rubber should be cheaper and far more durable. So, too, the protection of iron and steel in scores of places where they perish from oxidation would prove a simple, effective solution of this evil.

SEMI-HARD PIPE.

As liquid conductors there is a possibility that semi-hard rubber piping may compete with copper and lead pipes. So, too, lead armored cables may give way to those coated with semi-hard rubber. The product would be just as flexible, much lighter, and cheaper.

INDIA RUBBER WOODENWARE.

In the line of sports will come hard rubber golf clubs, cricket and baseball bats, fishing rods, polo mallets and balls, and so on. The city policemen will no longer use a club of locust wood; it will be of hard rubber. And this will extend all through the line of woodenware where anything especially tough, flawless and fine is required.

RUBBER LINOLEUM AND OIL CLOTH.

Speaking again of floor coverings, oil cloth and linoleum as such cannot exist once rubber is really cheap and plentiful. Every

rubber manufacturer knows that a pound of Para rubber will go as far in compounding as ten pounds of boiled or oxidized oil. The oil costs, say, seven cents a pound, and rubber at less than four times that price will certainly dispossess it. Then, too, it is more flexible, easier to work and far more durable.

Artificial leathers are likely to find it difficult to compete with the rubber product that will come in with low-priced rubber. Indeed, all of the rubber counterfeits made of cellulose, celluloid or casein, whether soft or hard, are likely to find that the original will be preferred just as soon as it is the cheapest.

RUBBER SOUND DESTROYERS.

India rubber as a deterrent to noise has gone far. It will go farther. The rubber-shod taxi-cab has stilled the echoing klip-perty-klip of the flat-footed cab horse. It should be used to silence the clash and clatter of the modern city electric car and the jar and clamor of elevated and subway trains. In a score of industries it is needed—as cushions under modern printing presses, laundry machines and other city nuisances.

Would it not be possible also to still the shrill clatter of the thousands of shuttles in great weaving plants by the use of rubber?

The boiler maker certainly needs some sort of rubber silencer for his work, and the pneumatic riveter will not be perfect until rubber cushions absorb the far-reaching sound of its blows.

When this is accomplished and the day of deliverance comes, every bell in Christendom should send out its peal of praise—with soft rubber tongues.

RUBBER GLUE AND MUCILAGE.

Into the broad field of glues, mucilages and other adhesives will a great variety of new rubber cements force their way. The only deterrent will be high cost of solvent. But with low-priced *Hevea* rubber and the consequent fall in the price of rubber scrap, that will be melted or distilled, and new stickers and valuable by-products will be obtained that will find wide markets. Certainly a rubber glue that would be self-vulcanizing and that would not soften and let go in damp weather would be a boon.

INDIA RUBBER ROADS.

Roadways of rubber are ideal, theoretically, but the asphalts under modern manipulation are likely to be always cheaper and just as effective. Rubber sidewalks (once a non-slipper compound is evolved) made of scrap are likely one day to run for miles in the modern city.

INDIA RUBBER PAINTS.

These have in the past been widely advertised and sold, but they were oil or asphaltum at heart, not rubber. Scrap rubber is likely to furnish actual rubber paints and real rubber roofing. It will mean experiment and adjustment and a new series of dryers, but that should not baffle the chemist in this day of rubber expansion.

RUBBER CAR SPRINGS.

As the price of rubber in the past increased, certain products disappeared—the rubber car spring for example. As an assistant for the excellent steel springs of today, with a new and lower scale of prices it will come back, not only in railway carriages, but in manifold places where cost has prevented its use. Wherever there is a shock there will be put a rubber spring; wherever a rattle, an anti-rattler.

INDIA RUBBER PAPER.

Goodyear had a book with pages of rubber and fiber. Then rubber became costly and it was forgotten. For certain moisture proof papers rubber is certainly better than oil. In wall papers of the Linerusta Walton type it is more than a possibility. Bible papers made of pure gum would be wonderfully suited to certain modern creeds.

RUBBER CROCKERY.

It is with much doubt that I make this suggestion—that of white rubber dishes for the great restaurants, or bath tubs of hard rubber for the home. Perhaps it is as well not to encroach upon the pottery industry until rubber becomes as cheap as Kaolin.

The list grows long, and this is but a beginning; there are scores of industries yet to be viewed, and above all the backbone of all prosperity—the farmer—has been neglected. Perhaps—and this is but a vague suggestion—if he raised his milk-fed chickens on rubber latex, egg shells would cease to be fragile.—*India Rubber World*.

Six thousand bushels of lodgepole pine seed are being collected this fall on the Arapahoe national forest, Colorado, for use in reforestation work next spring.

William Penn, in his Charter of Rights, provided that for every five acres of forest cleared one acre should be left in woods. Foresters today maintain that on an average one-fifth of every farm should be in timber.

RECONNAISSANCE OF FRUIT FLY PARASITES.

November 12, 1914.

Board of Commissioners of Agriculture and Forestry, Honolulu, T. H.

Gentlemen:—During October, while in the Kona district on the Island of Hawaii, and while making casual investigations of a coffee field and its condition as to the presence of fruit fly, I noticed the presence in this field of a large number of *Braconid* parasites. Capturing some specimens my suspicion as to their identity was immediately confirmed. There were examples among them of *Opius humilis* and *Diachasma tryoni*, two of the Braconids which Prof. Silvestri introduced into Hawaii from South Africa and Australia respectively in May of 1913 (cf p. 5, Silvestri's report).

You will note in the report an account of the difficulty he had in breeding female specimens of these particular parasites under insectary conditions and that, rather than take undue chances on their multiplication by artificial means, it was decided to liberate the few remaining females of both species under natural conditions in the coffee fields of the Kona district. For this purpose Mr. D. T. Fullaway, who was at that time assisting Prof. Silvestri in the breeding work, was sent to Kona and there liberated four females and many males of the Australian species under two tents at Honaunau, South Kona, and three females and many males of the South African *Opius* under two tents at Holualoa, North Kona. These liberations took place on June 12, 1913. A further small consignment of the Australian species was sent to Kona for liberation about a month later. In October, 1913, or about four months after the liberation made by Fullaway, I sent to Honaunau and Holualoa for infested coffee berries from the one-fourth acre which I had made previous arrangements to have reserved in the neighborhood of each of the tents with a view to assisting the multiplication and distribution of these special parasites. From these samples we were successful in recovering the South African parasite (*Opius humilis*), but not the one from Australia (*Diachasma tryoni*). This fortunate recovery enabled us at that time to make a further distribution of the *Opius* not only in Kona, but also on most all the islands, including Oahu. Since then it has been repeatedly recovered in various districts from the fruit fly pupae bred out of several varieties of infested fruits. In August, 1914, from a sample of infested berries sent from Kaawaloa and Kiloa, Kona, a few specimens of the Australian species (*Diachasma tryoni*) were also recovered, but the same difficulty—as to the breeding of females under insectary conditions—was met with.

My recent observations in the coffee districts of North and

South Kona covered 26 to 28 miles of almost continuous coffee fields, eighteen fields about one and one-half miles apart having been investigated. The result showed that both the Australian and South African parasites were in evidence in all the fields in South Kona, while there was a scarcity of the former in those in North Kona. This may have been caused by the scarcity of ripe berries in certain fields visited. In North Kona both sexes of the Australian parasite (*Diachasma tryoni*) were captured over twenty miles from the original place of distribution, the date of which, as previously stated, was June 12, 1913.

Herewith I am submitting you a statement giving details of all the captures of these parasites in the many fields visited and which have been above referred to. You will note that all captures were made with a small hand net—by either sweeping or when the insects were on the wing, principally by the latter method.

During the above investigations I was accompanied and assisted by Dr. E. A. Back, who is in charge of the Federal fruit fly investigation here. Dr. Back also took samples of berries from each of the eighteen fields visited with a view to later determining, if possible, the percentage of fruit fly and parasites at the time of our visit.

In conclusion I will state that the infestation of the coffee berries by fruit fly in the Kona district is this year at least fifty per cent less than a year ago. In some of the fields it was difficult to find any great infestation at all.

Respectfully submitted,

W. M. GIFFARD,
President and Executive Officer, Board of Agriculture
and Forestry.

Investigations as to distribution of *Opis humilis* and *Diachasma tryoni* throughout the coffee fields in South and North Kona, either one or both of these having been collected by W. M. Giffard and Dr. E. A. Back in the following fields over a distance of twenty-six miles between October 28 and 31, both inclusive, viz:

(In all these fields Dr. Back gathered samples of ripe berries and either saw or took parasites, whilst Giffard confined his work to collecting adult specimens on the wing or by sweeping. In all instances only a small number of parasites were taken, many of those captured having been liberated.)

SOUTH KONA.

No. 1. Oct. 31, 1914—At Kalahiki, one and one-half miles south from Hookeena Church on main road. Field scarce of ber-

ries. Caught nine specimens (*Diachasma tryoni*, all males). Parasites plentiful.

No. 2. Oct. 31, 1914—At Hlookena, opposite church on main road. Berries plentiful in this field. Saw many parasites. Caught six specimens (*Diachasma*, 4 males, 2 females).

Special. Oct. 28, 1914—At Honaunau, opposite Honaunau store on main road. In this field, in which berries were plentiful, six specimens of both species (2 *Opius* and 4 *Diachasma*, males) were taken by W. M. Giffard, being the first taken during the period of investigation, whilst Dr. Back was gathering berries from a field one mile mauka of the store, where the original *Diachasma* were liberated in June, 1913. Large numbers of parasites seen in this makai field by W. M. Giffard.

No. 3. October 29, 1914—At Honaunau, one-half mile mauka Honaunau store. On this day Dr. Back took seven specimens while collecting berries (4 *Opius*, 2 males and 2 females, and 3 *Diachasma*, males).

No. 4. Oct. 29, 1914—One-half way between Honaunau and Kahaloa, in coffee field opposite new Bishop Estate road junction with main road. Caught 5 specimens (4 *Opius* and 1 *Diachasma*, all males).

No. 5. Oct. 29, 1914—At Kahaloa near Michado store. Berries and parasites plentiful. Caught 10 specimens (all *Opius*, 2 females and 8 males).

No. 6. Oct. 29, 1914—At Kealakekua, opposite Capt. Cook Coffee Mill. Berries fairly plentiful, with many parasites. Caught 7 specimens (5 *Opius*, 4 males, 1 female, and 2 *Diachasma*, 1 male, 1 female).

No. 7. Oct. 28, 1914—On makai road to Napoopoo on land of Kahaloa. In field opposite schoolhouse. Berries not plentiful. Took 2 specimens *Opius*, both females.

No. 8. Oct. 28, 1914—On same road in field opposite papaia grove. Berries not plentiful. (Took 2 *Opius*, males, and 1 *Diachasma*, male.

No. 9. Oct. 28, 1914—On same road one-fourth mile nearer Paris Ranch house. Took 1 specimen *Opius*, male. Berries not plentiful.

N.B.—Parasites evidently scarcer in fields along lower Kealakekua or Napoopoo road than mauka, as fewer were seen.

NORTH KONA.

No. 10. Oct. 30, 1914—At Kainaliu opposite Niwashta grocery store, about two miles north from Miss Paris', took 3 parasites, all *Opius*, 2 females and 1 male). Saw numbers of parasites. Coffee berries plentiful.

No. 11. Oct. 30, 1914—At Honalu, about four miles north from Miss Paris'. Took 2 parasites (both *Opius*, 1 female, 1 male). Saw a few others, but berries not plentiful.

No. 12. Oct. 30, 1914—At Keauhou, about three-quarters of a mile south of Kailua road junction. Took 6 parasites (all *Opius*, 5 males, 1 female). Saw numbers.

No. 13. Oct. 30, 1914—At Kahaluu (Bishop Estate land), in Oka's coffee field, about two miles south of Holualoa. Took 12 parasites (all *Opius*, 11 males, 1 female). Saw large number. Berries not very plentiful.

No. 14. Oct. 30, 1914—Lanihau, in field opposite store of Nakahara, about three miles north of Holualoa post office. Took 5 specimens (all *Opius*, males). Both berries and parasites plentiful.

No. 15. Oct. 30, 1914—At Holualoa, in field of Hyashihara, where a second tent containing *Opius humilis* were liberated, I took 1 *Opius*, female, and a small Braconid sp. The same conditions prevailed in this field as in that of Kimura.

No. 16. Oct. 30, 1914—At Holualoa, in fields of Kimura, where a tent containing original *Opius humilis* parasites were liberated. In field makai of Yokohama store on main road I saw no *Opius* at all, but Dr. Back says he saw two. Coffee berries were scarce, crop having been picked. On same land mauka of road I took 1 specimen (*Opius*, female), but there was likewise a scarcity of berries.

No. 17. Oct. 30, 1914—At Kalaloe, about 2½ or 3 miles north from third junction of road to Kailua beyond Honokohau. Took 12 specimens (6 *Opius*, 2 males, 4 females, and 6 *Diachasma*, 3 males, 3 females). Coffee in this small field was wild, overgrown and uncultivated, with berries only fairly plentiful. Saw many parasites.

RECAPITULATION.

From Kealakekua to and
beyond Honokohau.

NORTH KONA.

Opius. *Diachasma.*

3 6

2

6

12

5

1

1

6

—

36

—

6

15 Miles.

From Kealakekua to and
beyond Hookena.

SOUTH KONA.

Opius. *Diachasma.*

2 9

4

4

10

5

2

2

1

—

30

—

26

12 Miles.

W. M. GIFFARD.

Honolulu, November 10, 1914.

A REVISED LIST OF HAWAIIAN VARIETAL NAMES
FOR KALO.

By VAUGHAN MACAUGHEY and JOSEPH S. EMERSON.

Since the publication of a series of articles in the *Hawaiian Forester* concerning the kalo in Hawaii, a number of varietal names have been added to the list, and certain revisions found desirable in names already published. The revised list follows:

A'a	Eulu
Aapu	Eulu keokeo
Aapu keokeo	Eulu kohu uwauwahi
Aapu lenalena	Ha'akea
Aapu eleele	Haawikea
Aapu lehua	Haehae
Aapu ulaula	Haehae eleele
Ahakea	Haehae keokeo
Ahapii-piialii	Haehae ulaula
Ahé	Haloa
Ahé eleele	Ha'o
Ahé lenalena	Ha'o eleele
Ahé ulaula	Ha'okea
Ai mahahā	Ha'okea haulaula
Akiahiale	Ha'okea hauliuli
Akoki	Ha'okea keokeo
Akole ka uula	Hapu'u
Ala	Hapu'u kea hapu'u keokeo
Aneli'i	Hapu'u eleele
Anunu	Hapu'u lenalena
Api'i	Hapu'u ulaula
Api'i kea	Hapu'u nukea or kukea
Api'ipi'i	Hapu'upu'u
Api'i ulaula	He'e
Apo	Heiliá
Apowai	Hekili
Apowale	Hele mauna
Apuwai	Hiwa
Apuwai keokeo, apuwai kea	Hoene
Apuwai lenalena	Hokeo
Apuwai eleele	Hoole na wao
Apuwai ulaula	Hualani
Auau leo nui	Hua moa
Aweoweo	Huli pu loa
Aweuweu	Ieie ilia
Eele	Ieie
Eleele	Iheiheilie
Eleele naioea	Ii
Elepaio	Ipu o lono

Ipu o lono keokeo
 Ipu o lono ulaula
 Ka-i
 Ka-i auetuwei
 Ka-i eleele
 Ka-i kea, ka-i keokeo
 Ka-i koi
 Kainele ueue
 Kalalama makahi
 Kalalau
 Kalani pili
 Kamau
 Kaneli'i
 Kani'o
 Kapalili
 Ka puu konane
 Kumú welowelolá
 Kiki'i
 Kili oopu
 Kupala
 Kawale uaua
 Kawelo
 Koa'e
 Koa'e keokeo
 Koa'e eleele
 Koa'e ulaula
 Kohiku
 Kooka
 Kukai iole
 Kumaka'u
 Kumú
 Kumú kea
 Kumú keokeo
 Kumú poni
 Kumú ulaula
 Kuoho
 Laho loa
 La-i o kona
 Lau ape
 Lau kapalili
 Lau kona
 Lau lele
 Lau loa
 Lau loa ha eleele
 Lau loa ha keokeo
 Lau loa ha uliuli
 Lau loa manini
 Lau loa oni'oni'o

Lau loa ulaula
 Lau nui
 Lelua
 Lehua aola
 Lehua eleele
 Lehua ha uliuli
 Lehua keokeo
 Lehua ku i ka wao
 Lehua lenalena
 Lehua ulaula
 Lehua oni'oni'o
 Lele
 Leo
 Lili lili moleno eleele
 Lili lili molena keokeo
 Liko lehua
 Lili lehua
 Loha
 Lola
 Manahá
 Manaha keokeo
 Mahahá ulaula
 Mahai
 Mahakeo
 Mai'i
 Maka lole
 Maka opio
 Maka ua
 Maka lole
 Maka opio
 Maka ua
 Makea
 Makohi
 Makoko
 Makole
 Makuku
 Makaweo
 Maii'i
 Manane
 Mamanu
 Manauea
 Mana
 Mana eleele
 Mana ha ulaula
 Mana hua
 Mana iea
 Mana kea or keokeo
 Mana lenalena

Mana melemele	Owau
Mana pipuka	Owene
Mana ulaula	Owene elele
Mana ulu	Owene keokeo
Mana wai	Owene lenalena
Mana wea	Owene melemele
Manini	Owene ulaula
Manini ha kikokiko	Pa'akai
Manini kakau	Pa'akai mikoniko
Manini lau kikokiko	Pala palaha
Manini ula	Palaha
Manmini	Palai'i
Manuia	Palai'i elele
Manulele	Palai'i kea or keokeo
Maua melemele	Palai'i poni
Maua ulu	Palai'i ulaula
Mimi iole	Pala kea or kaokea
Moa	Palili ulaula
Mohihi	Pana
Moi	Papa kole ka waa
Mokihana	Papa kole koa'e
Mokohi makohi	Papa pueo
Naio	Paua
Naioea	Pa-u o hi'iaka
Naioea keokeo	Pe'u
Naioea elele	Pelu haele
Naioea lehua	Pia
Naioea ulaula	Piapia
Na kalo aola o kalalau	Pihalale
Na kalo i kue	Pi'iali'i
Nana i puhene na kalo	Pi'iali'i elele
Neenee	Pi'iali'i keko
Nio	Pi'iali'i keokeo
Nohu	Pi'iali'i melemele
Ohe	Pi'iali'i ulaula
Ohe kea	Piko
Ohe ulaula	Piko elele
Ohia	Piko hao
Ohuehue	Piko kea
O ka he'e ko kai	Piko nui
Olaa loa	Piko a wakea
Olena	Piko uaua
Oopukai	Pohina
Oopu	Poni
Opae ula	Poni elele
Opukai	Poni kea
Opule	Poni ulaula
Owale	Poni uliuli

Popolo	Ula nui
Pueo	Ulaia
Pueo ha lenalena	Ulei
Puco keokeo	Uli
Puhi	Umiumi
Pu'u	Uwauwahi
Pu'u konane	Wa'e
Puwalu or pualu	Waianae
Uahi a pele	Waianuenue
Uahi a pele ulaula	Welehu
Uahi oki	Welowelo la
Uaua piko	Wehewa or wehiwa
Ualehu	Wewehiwa
Ula mau	Wia

Wireless telegraphy is being used in Canada in reporting on forest fires.

As many as 72 different kinds of wood are used in the manufacture of umbrella handles, canes and whips in this country.

Authentic records show that cinders, from a forest fire in the treetops in northern Washington this fall, were carried a distance of twenty miles.

The Philippine bureau of forestry has recently invited bids for the cutting of nearly 300,000 acres of choice timberland on the public forests on the Island of Luzon.

Officers of the Akanogan national forest in the State of Washington are installing powerful signal lanterns for night use in reporting forest fires from lookout peaks.

According to the latest available figures, Pennsylvania stands fifth in the production of wood pulp and is second to West Virginia in the amount of slabs and other sawmill waste used for pulp; Maine stands third.

California yew, which grows on the national forests of that State, is finding some use in present-day archery practice. Its qualities closely resemble those of the old-world yew which made the English long-bow famous in medieval times.

The Supreme Court of Pennsylvania has decided that the amount of damage collectable on growing timber set on fire through negligence is not only the value of the wood destroyed, but also the injury to the property as a whole through the destruction of the young growth.

It is said that the first sawmill in the United States was at Jamestown, from which sawed boards were exported in June, 1607. A water-power sawmill was in use in 1625 near the present site of Richmond.

The better wood engravings are made almost exclusively of boxwood, and the large blocks are made of small pieces glued together. The engraving is done across the end of the grain. Japanese wood prints, on the other hand, are made on lengthwise sections of cherry wood parallel to the grain.

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THE HAWAIIAN FORESTER AGRICULTURIST

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Naphthalene as an insecticide has its virtues set forth in an article elsewhere, taken from the *Agricultural News*, of the West Indies. It would appear to be worth trying, in field and house, as well as on animals afflicted with pests.

Mr. Fullaway's succinct report of his expedition to Africa and its results, in this number, adds to the encouragement of success in the natural control of the fruit fly and other pests of plants and animals. That the parasites he has procured are the right ones for the work required seems assured, and that they will easily become acclimated here appears settled from the way in which other species introduced by Prof. Silvestri have thrived and multiplied.

Anxiety is being felt, at this writing, about Mr. J. C. Bridwell, assistant superintendent of entomology, from whom no word has been received since Mr. Fullaway parted from him in Africa some months ago. He remained behind to breed fruit fly parasites, as a precaution against the eventuality of loss of those taken out of that country by his colleague. At the first alarm given relative to his silence, it was hoped that the worst was the detention of his correspondence by war conditions. As time passes, however, fears on his account increase.

Intelligent and modern forestry, such as has been conducted in Hawaii for eight or ten years past, may well prove the solution of the difficult financial problems of this Territory and its municipal subdivisions. Revenue from public land leases will gradually diminish to the vanishing point as the available domain becomes homesteaded, and, although this process may increase the taxable value of the land, the demands upon the revenue contingent on development and progress will constantly grow larger. There must be a limit to property and other special taxes to mark the dividing line between real prosperity and the article heavily discounted by the exactions of "Caesar," and, in the case of income taxes, with the Federal now added to the Territorial meas-

ure, that limit has undoubtedly been reached. Other countries—yes, and even municipal bodies politic—have proved that forests may be made to carry a large part, if not the entire burden of local government. Where trees have such rapid growth as they have in Hawaii, the utilization of forests for revenue is something that can be accomplished well within a generation. Since the fodder value of the algaroba bean has been thoroughly demonstrated, although yet only beginning to be developed, that particular tree of itself, with its marvelously quick growth, ought to be made as lucrative for revenue as mines of precious metals.

If legislation is needed to enforce the reasonable precautions against the recrudescence of bovine tuberculosis, where it has once been brought under effective control, which the Territorial veterinarian urges, then the coming session of the Legislature ought not be allowed to pass without enacting the requisite measures. Nothing short of compulsory destruction of condemned animals and thorough disinfection of the buildings and pastures that have harbored them should be the law of the land. No country has exceeded this Territory in the completeness with which dairy herds have been purged of tubercularly-infected cattle, or in the economy with which that result has been secured, yet, according to Dr. Norgaard, the task must wearisomely be repeated unless the sources of infection be absolutely eliminated. That means to this end be taken the Forester would urge as earnestly as it has the enforcement of the provisions for cleanliness in dairies, slackness in which respect the veterinarian has exposed as nullifying in great measure the protection milk consumers have received from the eradication of consumptive cows from dairy herds.

AGRICULTURAL COÖPERATION IN AUSTRALIA.

From a serial article running in the Journal of Agriculture, Victoria, by P. J. Carroll, senior inspector of dairy produce, the following extracts are taken:

"A movement was begun about the middle of the year 1900 amongst a number of coöperative butter factories to form a central association, the headquarters of which were to be in the city. The objects of this association were to receive and dispose of the produce of the factories, and undertake all the duties previously carried out by private agents.

"This was the first purely coöperative distributing company in Australia.

"At the time operations were commenced the paid-up capital of the company (The Victorian Butter Factories Coöperative Company, Limited) was £1,490. It is claimed that enormous savings have been effected in the cost of marketing the produce, and that

the shareholders are enabled to obtain legitimate prices for their output. One substantial saving, however, resulted in the reduction of the agents' commission by 1 per cent. The company made considerable progress, and at the end of six years extended its functions to the manufacture of butter-boxes and the business of freezing. The wisdom of the latter step was always regarded as questionable, seeing that the Government had previously entered into the work of freezing, handling and exporting perishable goods on a practically coöperative basis—that is to say, the Government did not lay itself out to make any profit on the undertaking. This company has now a paid-up capital of £8,000, and a reserve fund of £4,500, and £17,000 has been invested in freezing works and box factory. The turnover of the company since its inception has been £4,500,000, and the profit earned £38,250.

"About 1904 an impetus was given to the further extension of the principle of federating the coöperative butter factory companies by some disclosures made before a Royal Commission on the Butter Trade, which had sat some time previously. The Western District Factories' Coöperative Produce Company, Limited, which embraced most of the butter factories in the Western District of the State, was brought into existence. The chief objects for which the company was established are stated in the memorandum of association as follows: 'To buy, sell, export and distribute all kinds of dairy produce, bacon, poultry, eggs, honey, and any farm, dairy, and garden produce; to purchase, manufacture, and sell all farm and dairy requisites, including implements and machinery.'

"'The shares shall be allotted to and held only by butter, cheese or bacon companies.'

"The original issue of shares was 900 at £55 each, and the sum of £1,690 was paid up in money.

"The turnover of the company since 1904 amounts to £5,344,972. The profit is, approximately, £50,000, of which £12,500 has been expended in an extensive butter-box factory, where the whole of the boxes required for this group of butter factories is manufactured.

"There still remained a considerable area of the State, in the southeastern portion, known as Gippsland, which had not embraced the system of coöperative marketing. In 1905, however, a company consisting of thirty coöperative butter factories was formed for the purpose of dealing with the distribution of the output from these factories principally. The business of this company at its inception was confined to the sale of butter, cheese, eggs and bacon. After five years' experience it was decided to extend the sphere of operations to all kinds of farm produce.

"The original capital of the company, like its predecessors, was on a very limited scale, and for the first three years the sum of £867 represented the full amount paid up. Since that time, how-

ever, the capital has been increased to £21,000, and individual agriculturists and dairy farmers have been admitted as shareholders. During the eight years of this company's existence the total sales amounted to £3,757,000, resulting in a profit of £31,500. The sum of £25,000 has been paid in bonuses to producers, £1,655 in dividends, and £3,600 stands at reserve. In conjunction with this company there is also a large factory for the manufacture of butter boxes.

"Victorian farmers are becoming more critical regarding the methods of the middlemen, and are realizing the value of organization for their own protection.

"That the principal of coöperation is sound is fully emphasized in the illustrations already quoted. In the manufacturing and preparation of produce, and to raise the standard of such produce, the combined effort, if wisely directed, is *par excellence*. When applied to the purchase of stores and requirements for the farm and household, it should prove economical, but the ideal form of coöperation is the one that embraces both producers and consumers.

"Coöperative marketing and distributing societies, if not carefully managed and controlled, have a tendency to develop into profit-earning institutions, and thus become ordinary trading concerns. The idea should not be to make or hoard profits or accumulate capital, for this leads to extravagance and speculation. Rather should the management be actuated with the primary and simple idea of combining resources for the economical disposal and purchase of produce, and to educate its members in the best methods of producing, manufacturing and preparing their products for market."

It is stated that "farmers in various districts of the state are further organizing for the purpose of making savings in the cost of distribution of other products, such as potatoes, onions, cereals, hay, chaff, etc., and for the purchase of bran, pollard, seeds, etc." Several pages are devoted to the relation of various coöperative movements, also to the government policy of encouraging the taking up of homesteads, which includes advances on moderate interest for houses, etc., and in conclusion appears the following statement of results:

"Irrigation schemes constructed by the states run into many millions of pounds sterling. The state has adopted the policy of purchasing large areas of land commanded by these schemes, and subdividing them for intensive cultivation, and the settlement of those areas will mean a large increase in population. The management and supervision of these irrigation enterprises have been vested in a body consisting of three commissioners, and recently the control of irrigable lands has been transferred to this body.

"These manifold activities of the states, which are truly co-operative in character, supply the capital for the purchase of land,

stock and irrigation facilities. In other countries this becomes part of the functions of the Cooperative Banks or Credit Societies. Under such conditions, however, the initial capital must come from the settler himself, consequently he is impoverished to that extent, and not so well equipped to fight the battle which has to be undertaken before success can be achieved. The system in Australia is, therefore, in advance of that in other countries, and, by force of example, is fostering and promoting the true coöperative spirit. The progress of agriculture under such encouraging and healthy conditions is fully assured, and that the industry is going ahead by leaps and bounds is adequately attested by the following cogent facts:

"Production of butter in 1907.....	156,380,670 lbs.
" 1911	211,577,745 "
Increase, 35.33 per cent.	
Production of cheese in 1907.....	13,383,563 lbs.
" 1911	15,886,712 "
Increase, 18.70 per cent.	
Production of condensed milk, 1907.....	9,643,551 lbs.
" " 1911.....	22,983,707 "
Increase, 128.34 per cent.	
Production of bacon in 1907	40,719,181 lbs.
" 1911	52,264,652 "
Increase, 28.32 per cent.	
Production of wheat in 1906-07.....	66,421,359 bushels
" 1910-11.....	95,111,983 "
Increase, 43.19 per cent."	

FRUIT FLY CONTROL.

REPORT OF FIELD ENTOMOLOGIST FULLAWAY ON HIS EXPEDITION TO AFRICA.

E. M. Ehrhorn, Esq., Superintendent of Entomology, Honolulu, T. H.

Dear Sir:—Permit me to report my arrival from Teneriffe, Canary Islands, by way of Cuba and the Southern States, on October 27, 1914, with the following parasites which were collected in Nigeria, West Africa, in August, and taken to the Canaries for multiplication in our species of fruit fly *Ceratitis capitata*, viz:

- 300 females and males *Tetrastichus giffardi*;
- 12 females and 19 males *Diachasma fullaxayi* (?);
- 4 females and 22 males *Opius*, species undetermined;
- 10 females and 2 males *Spalangia*, species undetermined;
- 1 *Eucoila* undetermined.

Also from Teneriffe 3 specimens of a metallic *Chalcid*, species undetermined; also two vials containing *Tetrastichus*—parasitized pupae of the Mediterranean fruit fly (*Ceratitis capitata*), one with 23 pupae out of which 4 fruit flies had emerged, the other containing 9 pupae; also *Tetrastichus*—parasitized maggots in

three jars of fruit. This material represented breeding work accomplished en route.

The following morning, October 28th, I assumed charge of the insectary and commenced the multiplication of all these new species with the material which had been prepared in advance by you. The work has been going on continually since then and we are multiplying the species as rapidly as the insectary conditions permit. There is no doubt about the multiplication of *Tetrastichus* in large numbers as the new generation of parasites developing within the pupae of the fruit fly can be seen in a living condition through the pupal skin. The multiplication of the two Braconid species may be attended with some difficulty, as in Teneriffe I was bothered with the old difficulty of faulty mating.

The *Tetrastichus* is the species which Silvestri discovered in West Africa but lost on the way home. It was considered by him as one of the most important parasites of *Ceratitis capitata* in West Africa, and its introduction is especially recommended in his recent report. The two Braconids are similar in kind to the species now so successfully multiplying and spreading in the Kona district of Hawaii and about Honolulu, and ought to be very valuable in the control of the fruit fly. Both of them are larger than *Opius humilis* and have much longer ovipositors.

I regret that I cannot give positive information just now in regard to their ultimate establishment here, but the work as far as it has gone gives every promise of success.

Yours very truly,

DAVID T. FULLAWAY,

Field Entomologist Board of Agriculture and Forestry.

NOTE:—Since the above report was written I have succeeded with the multiplication of one of the above species of Braconids in the insectary.

D. T. F.

The timber industry represents 37 per cent of the annual production of wealth in British Columbia.

In addition to his own fire detective system, the supervisor of the Palisade national forest, Idaho, was notified of each fire by from five to ten different local settlers, who thus showed their co-operation in working for fire suppression.

The Uinta mountains of Utah, included within the Wasatch. Uinta, and Ashley national forests, should become a favorite recreation region, because of the many small lakes within depressions scooped out by glacial drifts. Seventy such lakes can be counted from Reid's peak, and one particular township, 36 miles square, contains more than a hundred.

DIVISION OF ANIMAL INDUSTRY.

Honolulu, October 31, 1914.

The Board of Commissioners of Agriculture and Forestry.

Gentlemen:—That bovine tuberculosis can be eradicated by the means and methods employed by this Board during the past four years seems now to have been fully demonstrated, but whether this aim is to be attained in the Territory of Hawaii within a reasonable space of time will depend entirely upon the compliance of the dairymen and cattle owners with certain requirements which the last general tuberculin test, now more than half finished, have emphasized as necessary to success.

The most important of these requirements is the immediate destruction of all reacting animals or else their absolute segregation. But this latter can no longer be accepted as accomplished so long as the reactors remain anywhere in the neighborhood of the healthy animals.

While none of the standard textbooks or current scientific periodicals as yet classify tuberculosis, whether human or bovine, as an extremely contagious disease, but still consider it as a mildly infectious disease which can be guarded against by ordinary hygienic and sanitary measures, so long as these are conscientiously carried out, *our* experience with bovine tuberculosis has now fully demonstrated that unless we classify and deal with it as an air-borne contagious disease, capable of being transmitted by wind and dust over distances far in excess of those hitherto accepted, we shall never be able to eradicate it here; and the only economic and effective measure known to live stock sanitarians in dealing with an air-borne contagious disease is destruction followed by disinfection.

This apparently radical statement is however based upon incontrovertible facts which, with the progress of the bovine tuberculosis control work, have asserted themselves more and more until finally demonstrated beyond doubt by the results. And these results show *that the disease persists only on the premises where reacting animals are retained* and in spite of any precautions adopted so far.

It is not the desire in this report to refer to individual cases and without such reference no actual proof of the above contention can be produced, but the statement is made for the purpose only of spurring on those dairymen who still adhere to this practice, to desist before their neighbors and colleagues in the dairy business, and who at great expense have cleaned their herds of tubercular animals, rise up and insist that the man who is harboring the infection by retaining his reactors is deliberately injuring the dairy industry in general and jeopardizing the dearly bought advantages of his neighbor as well as public health. For

it must be admitted that there is not a dairyman in the district who has not signified his willingness to "do the right thing" to co-operate with this Board in its effort to eradicate bovine tuberculosis—only there are some who want to do it in their own way and at their own time and convenience. And in the meantime we see fresh cases of infection developing in these "retained reactor" herds at an amazing rate the number of reactors doubling and even trebling between two tests, only a few months apart.

Segregation by wire fence, whether single or double and whether twenty or fifty feet apart, can no longer be accepted as safe, at least not in this climate where the infected manure dries quickly, is trampled to dust and scattered by the winds at least during 75 per cent of the days of the year.

Take as an example a case encountered during the past month—a lady owning three dairy cows all of which have been raised on the premises and all of which had passed the tuberculin test four times, the last time in April of this year. These cows were sent to a pasture for a period of about three months, while dry, there being supposedly no reactors or untested animals in the same enclosure. A few months after coming home fresh one of the cows developed a suspicious cough and the owner requested that the animals be retested. Two of them reacted and both were found upon post mortem examination to exhibit fresh tubercular lesions in cervical and thoracic lymph glands and one of them, the coughing one, in the lung tissue also. That these animals had come in contact with tubercular cattle during their absence from home cannot be doubted, but where and how the infection reached them could not be determined after the lapse of nearly half a year. But it is safe to conclude that unless retained reactors or untested tubercular animals were in the neighborhood, or else that the infection was carried to them by either wind-blown dust or drinking water, they certainly could not have contracted the disease.

A far stronger proof, however, of the danger of spreading the disease by means of the retained reactor will be found in the following figures: An aggregate of 3000 tuberculin tests have been made during the present August to November test. About 500 of these injections were made on premises where previous reactors have been retained for shorter or longer periods before being slaughtered. Of this number not less than 39 reacted, including a number of calves and heifers. Among the remaining 2500 head, all on premises where reactors are destroyed without delay, only eleven reactors were found, or 0.44 of one per cent as compared to nearly eight per cent. If this does not prove the retained reactor to be an expensive luxury, it at least demonstrates the ease with which the infection is spread, as all ordinary precautions against this are supposed to have been taken in every case. When it is further considered that beef prices at the present time are very high an ordinary milk cow in fairly

good condition bringing from \$50 to \$60 on the block if passed for beef (and hardly any fail to pass now that practically all the bad cases have been eliminated), then it is difficult to understand how any dairyman can see it to his profit to risk the infection of one or more cows from each reactor he retains on his premises, unless he continues to utilize the milk from his reactors in boiled and pasteurized condition, which again can rarely be done to advantage when the risk is considered. The Dairymen's Association, we are assured, will not accept the milk from reacting cows for treatment in their purifying plant as this would necessarily mean admixture with the milk from the clean herds, besides which the method would be illegal under the existing milk ordinance. Nor would such milk, if the facts were known, find a market so long as milk from clean herds is obtainable. There consequently remains only the one object of fattening the reactor before sending it to the butcher, and with the possibility of the carcass being condemned this also would seem of doubtful value, as a consumptive animal is not given to putting on flesh rapidly.

In view of these facts it is therefore to be hoped that the dairymen who still have reactors in their possession will take advantage of the present great demand for beef and consequent high prices, prices which are fifty to one hundred per cent higher than they were a year ago, and at the same time make an earnest effort at ridding their stables and premises of the tuberculous infection; or, in other words, have every dairy animal over four months old tested, every reactor butchered, all stables, mangers and stanchions scraped and whitewashed, and all yards, sewers, drains and cesspools scraped and cleaned until, so far as possible, all of the old infected manure has been removed.

With bovine tuberculosis at a hitherto unknown minimum the present must be considered a very favorable time for a concerted effort at complete eradication, so far as this district is concerned, and will undoubtedly cost less and prove of quicker advantage to the dairymen than at any previous time and possibly at any subsequent time and will, with the present great efforts at combating the great white plague, no doubt be appreciated by the local health authorities as well as by the public in general.

An article on the subject of bovine tuberculosis in its relation to public health, and especially with regard to its transmission to children, is now being prepared and will be delivered at the annual meeting of the Medical Society of Hawaii on Saturday, November 21. The object of this paper is to enlist the coöperation of the medical profession in educating the public in the knowledge and appreciation of clean and wholesome milk.

Very respectfully,

VICTOR A. NORGAARD,
Territorial Veterinarian.

REPORT OF ASSISTANT VETERINARIAN.

Honolulu, October 31, 1914.

Dr. W. A. Norgaard, Chief of Division of Animal Industry.

Sir—I beg to submit the following report for the month of October, 1914:

Tuberculosis Control.

The following dairy cattle have been tested during the past month:

	T.	P.	C
F. M. Swanzy	1	1	0
() R. & L. Company... ..	271	270	1
do do	328	328	0
do do	257	257	0
do do	5	5	0
F. S. Lyman	29	29	0
Waialea Industrial School	55	55	0
C. M. Cooke	7	7	0
Mrs S. J. Grace.....	3	1	2
P. M. Pond	315	314	1

From the above it will be seen that a total of 1571 head of dairy cattle were tested, out of which number 1567 were passed and tagged and 4 were condemned and branded.

A post mortem examination was made on the two cows condemned at Mrs. Grace's dairy, the results of which revealed pulmonary tuberculosis in each case, the diaphragmatic lobes of the lungs being filled with masses of cheesy tuberculous material, many of the bronchi being filled with a considerable quantity of phlegm which during the life of the animals was being constantly coughed up and the infectious material being disseminated throughout the dairy.

As the animals had been raised on the place from the time they were very small calves and had repeatedly passed the tuberculin test up to eight months ago, the only way they could possibly get the infection was from the valley pasture in which they had been kept when dry. This emphasizes the importance of obtaining definite knowledge regarding the condition of the pasture and the health of the animals which may be contained therein before exposing stock known to be healthy to any infection which may be present.

It will be seen from the above list that 861 head of cattle were tested for the Railway ranch out of which number only one old cow was condemned, which is a most excellent showing and points to the rapid elimination of the disease on this ranch.

Importation of Live Stock.

- Manoa, San Francisco: 10 crates poultry.
 Mongolia, Orient: 1 crate Japanese games.
 Matsonia, San Francisco: 28 crates poultry, 1 crate rabbits,
 W. F. & Company.
 Shiyo Maru, Orient: 1 crate Japanese games.
 Sierra, San Francisco: 1 crate poultry, M. Dellan.
 Enterprise, San Francisco: 11 crates poultry; 78 hogs, 1 Hol-
 stein bull, 39 mules, Schuman Carriage Co.; 6 crates (12) An-
 gora goats, Q. A. Robinson.
 Hyades, Seattle: 2 Angus bulls, Honolulu Ranch; 6 Angus
 bulls, Maui Agricultural Co.
 Wilhelmina, San Francisco: 1 crate Belgian hares, Z. K.
 Myers; 18 crates poultry.
 Mongolia, San Francisco: 1 dog, P. L. McIltrac.

Respectfully submitted,

L. N. Cass,
 Assistant Territorial Veterinarian.

 DIVISION OF ENTOMOLOGY.

Honolulu, October 31, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—I respectfully submit my report for the work per-
 formed by the Division of Entomology for the month of Octo-
 ber, 1914, as follows:

During the month 36 vessels arrived at the port of Honolulu
 of which 16 carried vegetable matter.

<i>Disposal.</i>	<i>Lots.</i>	<i>Parcels.</i>
Passed as free from pests.....	1,145	30,441
Fumigated	1	2
Burned	27	27
Returned to shipper	1	1
Total inspected	1,174	30,471

Of these shipments 30,228 packages arrived as freight, 121
 packages as baggage of passengers and immigrants and 122 pack-
 ages through the postoffice.

RICE AND BEAN SHIPMENTS.

During the month 40,674 bags of rice and 2,113 bags of beans
 arrived from Japan which after careful inspection were found
 free from pests and were passed for delivery.

PLSTS INTERCEPTED.

Twenty-six packages of fruit and one package of vegetables were found in the baggage of passengers and immigrants from foreign countries. All this material was seized and destroyed by burning. A species of five-leaved pine from Japan in the baggage of a passenger was sent back on board of the steamer under a ruling of the Federal Horticultural Board, as all such pine trees are prohibited from landing in the United States or its territories on account of the white pine blister rust (*Peridermium strobi*), a very serious disease of pine trees. Two European Bay trees were fumigated on account of being infested with the soft scale (*Coccus hesperidum*).

Tucked away among some vegetable seeds and herbs from Portugal was a lonely apple which we seized and destroyed. It is just in such material that some pest could come into the Territory. Fortunately there exists a thorough coöperation between the postoffice authorities and our department and very little escapes our inspection.

A small quantity of beans, peas and corn was fumigated for a local firm on account of weevil infestation.

BENEFICIAL INSECTS.

During the month 7200 parasites were liberated from the breedings in the insectary, consisting of the following: For horn and house fly, 1600 *African horn fly* parasites, 2000 *Philippine Spalangia*, 2000 *Philippine Pteromalids*. For fruit fly, 250 *Galesus silvestrii* and 750 *Opius humilis*.

On October 9 I received a shipment of parasites from Mr. Fred Muir, consisting of one cage with many living *Tiphia* species, the natural enemy of *Anomala orientalis* and the Japanese beetle, so-called. This shipment was delivered by me to Mr. H. O. Swezey of the H. S. P. A. and he liberated 60 specimens at Aiea. A few specimens were kept for indoor breeding. All the soil containing the parasites was destroyed by burning. On October 27 I received two cages from Mr. Muir which I personally delivered to Mr. Swezey at the H. S. P. A. station. Mr. Swezey has liberated 14 parasites from one cage and the other cage is supposed to contain parasites in the pupal stage, so that it may take a few weeks for the adults to issue. All these shipments are sent to me for the H. S. P. A., as it avoids delay and safe delivery by using this system. Every care is taken with the material, which is under quarantine regulations. From the second sending quite a number of parasites have been kept for indoor breeding.

On October 27 Mr. D. T. Fullaway returned from Teneriffe with a good supply of parasites for the fruit fly. Having received a cable from him requesting me to have on hand infested fruits, etc., I got everything necessary in good shape and he had no difficulty in finding sufficient material for his work of propagating.

He has taken charge of the insectary and breeding work and has submitted a short report.

HILO INSPECTION.

Brother M. Newell of Hilo reports the arrival of six steamers and one sailing vessel. Five steamers brought vegetable matter consisting of 303 lots and 5447 packages. Of this number twenty boxes of wormy apples were rejected and returned to shipper. Twenty bags of potatoes and one bag of turnips had to be cleaned before delivery.

INTER-ISLAND INSPECTION.

During the month of October 62 steamers plying between the islands were attended to and the following shipments were inspected and passed:

Plants	83 packages
Taro	673 "
Vegetables	37 "
Total passed	793 "

The following packages were refused shipment on account of infestation or of having undesirable soil attached to the plants:

Plants	26 packages
Fruit	17 "
Total refused	43 "

Respectfully submitted,

E. M. EHRLHORN,
Superintendent of Entomology.

Of two million sheep annually grazed in the State of Utah, more than a million are on the national forests, or, including lambs which are fattening for market on the forest ranges, over a million and three-quarters.

Boxmakers in the United States use more than four and a half billion board feet of lumber each year, or more than one-tenth of the entire lumber cut of the country.

DIVISION OF FORESTRY.

Honolulu, October 31, 1914.

Albert Waterhouse, Esq.,
 Acting President and Executive Officer,
 Board of Agriculture and Forestry.

Dear Sir:—The following report gives the principal work done during the month of October, 1914:

NURSERY.

Distribution of Plants.

	In seed boxes.	In boxes trans- planted.	Pot grown	Total.
Sold . . . . .	....	...	310	310
Gratis	2000	200	1013	3213
	2000	200	1323	3523

COLLECTIONS.

Collection, on account of plants sold amounted to.....\$ 7.35
 Rent of building, nursery grounds for month of September. 35.00
 \$42.35

PLANTATION COMPANIES AND OTHER CORPORATIONS.

The distribution of plants amounted to 8250 in seed boxes and 150 pot grown; total, 8400.

MAKIKI STATION.

The demand for trees from homesteaders and others has every indication of being large and we are using all our efforts to have as good a supply as possible on hand. Arbor Day will also relieve us of large quantities of pot grown trees.

HONOLULU WATERSHED PLANTING.

The work connected with the planting of trees in the neighborhood of Sugar Loaf Hill is progressing satisfactorily. During the month 502 koa and 212 kukui trees were planted. The trees previously planted have all been hoed. The number of trees planted to date amount to 4766 koa and 1048 kukui trees; total, 5814.

MOLOAA FOREST RESERVE, ANAIIOLA, KAUAI.

Mr. Kaina D. Lowell reports that 2500 holes were dug and planted with eugenia (Chinese plum) seed during October and that the seeds were sprouting very well.

PLANTING NAHIKU BOUNDARY.

Mr. W. A. Anderson is making preparations for planting trees along the forest reserve boundary above Nahiku home-steads and we will ship the trees as soon as he is ready for them.

WAIHOU SPRING FOREST RESERVE PLANTING.

The trees are also ready for the Waihou Spring forest reserve planting, which Mr. L. von Tempsky has agreed to plant.

ADVICE AND ASSISTANCE.

The following gives the number of visits made and advice given to people in and around the city of Honolulu:

Calls in and around city, 6; advice by telephone, 8; advice to people calling at nursery, 5.

Very respectfully,

DAVID HUGHES,
Forest Nurseryman.

DIVISION OF HYDROGRAPHY.

Honolulu, November 7, 1914.

Board of Commissioners of Agriculture and Forestry.

Gentlemen:—The following report of operations of the Division of Hydrography during October, 1914, is submitted:

RAINFALL.

The long period of exceptionally heavy rainfall terminated with the heavy storm of September 22-27, and since that time the precipitation on all islands has been about normal. All streams have measured their normal low water flow.

FLOOD DAMAGE.

A visit to the new mauka stream gaging station on windward Kauai early in October showed considerable damage done to the stations on the Waioli, Lumahai and Hanalei rivers. All construction work and equipment were intact, the damage resulting from the stream channels being checked with boulders, gravel and debris. The floods also demonstrated the fact that the intake pipes of all windward stations were too short and that the new station on the North Wailua river has been established too close to the stream, and with the register shelter about four feet too low. This station was not damaged by the recent floods, but previous flood records which have been furnished us since the late flood show that this stream has reached a flood level at least two feet above the present one. For this reason

this station is now being moved back about ten feet and raised four feet. It is anticipated that the clearing of the choked channels of the Waioli, Lumahai and Hanalei, and the extension of all intake pipes will be completed by December 31, 1914.

The flood discharge data obtained should be of great value in determining the size of the bridge openings when new bridges are built to replace those washed out by the flood.

OAHU AND ADMINISTRATION.

The coöperative investigation work being done at the Waipio experimental station progressed favorably. It is anticipated that the work at Waipio will be completed in November, and a series of ditch loss investigations started on various plantations on Oahu. Mr. Kimble also made a number of measurements which will be of value in rating the coöperative stations on the Kahuku and Laie plantations.

Mr. Austin visited three rainfall and 22 stream gaging stations, and made 30 stream and ditch measurements. He also measured the flow from the new U. S. Army artesian well at Fort Shafter and of the Kawaiolena springs near Liliha street, Honolulu. One measurement was made of the discharge from the north portal of the Waiahole tunnel.

KAUAI.

A foot suspension bridge was constructed on the North Wailua river in order that the new station now being established on the East Branch of the North Wailua might be reached in flood.

From October 17 to 25 all of the new stations recently built on windward Kauai at elevations of from 650 to 850 feet above sea level were visited by Mr. Dort, accompanied by the Superintendent of Hydrography. A survey of damage done by the recent floods was made and plans outlined for changes made necessary by information developed during these floods. Mr. Dort visited 8 stream gaging and 4 rain gaging stations. Mr. Horner visited 8 stream gaging and 8 rain gaging stations.

MAUI.

Mr. Bailey, accompanied by the Superintendent of Hydrography, spent October 3 and 4 inspecting work, and on October 5 a reconnaissance was made of two possible storage sites on the headwaters of Maliko gulch in the vicinity of Kailiili, at an elevation of about 3200 feet above sea level.

During the balance of the month Mr. Bailey visited 30 stream gaging stations, established 12 permanent bench marks, equipped 10 automatic register stations with interior gage height registering devices, and made 16 stream measurements.

On October 31 he discontinued his temporary headquarters at Wailuku and left for Honolulu where he will act as Acting

Superintendent of Hydrography during the absence of the Superintendent of Hydrography.

KONA, HAWAII, REPORT.

Mr. Kimble spent ten days assembling and preparing data, maps and estimates on this report which will be completed by December 31, 1914.

NOVEMBER PLANS.

Oahu.

Mr. Kimble will continue experimental work on water duty, ditch losses, etc., at the Waipio experimental station. He will also carry on the rating work in connection with the coöperative stations on the Kahuku and Laie plantations.

Kauai.

The new clock register station on the East Branch of the North Wailua river will be completed. The station on the North Wailua river will be raised and moved back to a safer level and location, and if possible the work of clearing the channels of the Waioli, Lumahai and Hanalei of flood debris will be started. At the same time the intake pipes of these stations will be extended.

Maui.

The only work to be done on Maui will be an inspection trip to all automatic register stations.

Hawaii.

Mr. Bailey will probably visit Hawaii to secure discharge data desired by the Territorial Attorney General.

Arrangements have been made by which the Kiilae stream measurement station and all mauka rainfall stations in Kona, Hawaii, will be maintained by private parties who will furnish records to this office.

GENERAL.

Mr. Larrison left for the mainland on November 5 for a conference of district engineers of the U. S. Geological Survey which will be held in Washington, D. C., in December, 1914.

TABULATION.

Island.	Sept. 30.	Established.	Discontinued.	Oct. 31.
Kauai	36	0	0	36
Oahu	50	1	2	49
Maui.	42	0	0	42
Hawaii (Kona)	1	0	0	1
Total	129	1	2	128

Very respectfully,

C. N. BAILEY,
Acting Superintendent of Hydrography.

NAPHTHALENE AS AN INSECTICIDE.

Naphthalene is one of the by-products obtained in the distillation of coal tar. It has been long known as an insect repellent, and some of its uses are very familiar to nearly everyone. It may be of interest, however, to bring together a brief account of several different ways in which it may be employed.

The best known use for naphthalene is for the protection of stored clothing, books, insect collections, and museum specimens. Clothing such as woolen garments, feathers, and furs are protected from moths and beetles by being packed in tight boxes, or securely wrapped in parcels covered with paper, cotton, or linen cloth. Moth balls, naphthalene flakes or crystals, freely used in such boxes or parcels, give good protection, the insects being repelled by the smell of the naphthalene.

Books which are kept in closed bookcases may be protected to a large extent by scattering flaked naphthalene freely on the shelves, behind the books, and on and between the books themselves.

Insect collections should be kept in tight boxes; naphthalene flakes in the bottom of the boxes, or moth balls on pins in the corners of each box, will keep out insects and mites which are destructive to stored insects. Moth balls can be fixed on pins quite easily. An ordinary pin heated in the flame of a lamp or candle can be forced through the moth ball by means of pliers or forceps, and when it cools the naphthalene will set firmly round it.

As a remedy to be used against cockroaches, naphthalene is not so well known. In the *Agricultural News* for September 27, 1913, a note appeared giving an account of good results obtained from the use of a mixture of equal quantities of naphthalene (finely powdered) and boracic acid. This mixture was plentifully sprinkled in places frequented by cockroaches. The insects were greatly reduced in numbers after the second application, which was made after an interval of two weeks.

The use of naphthalene for freeing a house from an infestation of fleas was noted in the *Agricultural News* for May 9, 1914. In this case a new house was seriously infested before being inhabited. Naphthalene to a depth of 2 or 3 inches was put on the floors of one or two rooms, and after twenty-four hours was swept up and put into the other rooms and passages of the house, until all were so treated. The fleas were all killed out.

Naphthalene is also very useful as a dry bath for dogs and cats infested with fleas. The insecticide in a very finely powdered condition, or in the form of flakes, is rubbed into the coats of the dogs or cats, and the fleas are rapidly driven out by it. They fall to the ground in a stupefied condition; if the operation is carried on over a sheet of cloth or strong paper, and the naphthalene is freely used, the fleas are killed by continued contact with it, and it can be taken up and used over and over again.

The naphthalene has no disagreeable or deleterious effect on the animals, and does not leave any disagreeable smell in their coats after the application. Dogs treated with naphthalene in this way remain much freer from fleas than when the control of these insects depends on ordinary washing and "picking."

Naphthalene has recently been used with success in the prevention of insect attack on stored grain. In India (see *Agricultural Journal of India* for January, 1914) an interesting series of experiments was published, which showed that this substance gave a thorough protection to stored maize over a period of thirteen months. The grain was placed in cylindrical bins, about 6 feet deep by 3 feet in diameter, each bin holding about 40 bushels. The charge used was 1 pound per bin, divided into four lots of one-quarter pound each. These were enclosed in bags made of cloth with open texture, and were placed at equal distances from the bottom to the top. The bins were tight, and were tightly covered. At the conclusion of the trials it was found that about one-half of the naphthalene still remained in the bags.

The results were very satisfactory, and indicate that naphthalene used in this way provides effective protection for stored grain.

Naphthalene is very useful in the preparation of emulsions of oil in soap solutions, in making spray mixtures for the control of scale insects.

The peculiar property possessed by this material of bringing about an easy and perfect combination of oil and soap solutions was discovered by Mr. H. H. Cousins some years ago when connected with the Eastern Agricultural College at Wye, England. Mr. Cousins prepared a mixture to which he gave the name Paraph, which was composed of soft soap, naphthalene and kerosene oil. This was successfully used against insect pests on plants; and later, in Jamaica, Mr. Cousins applied it also to the destruction of ticks on cattle, fleas on dogs, and other similar purposes.

Mr. H. Maxwell-Lefroy prepared a mixture of whale-oil soap and Barbados crude oil (*West Indian Bulletin*), applying Mr. Cousins' principle of using naphthalene to bring about the combination of the oil and soap. More recently, Mr. J. C. Moore of St. Lucia has applied the same methods to the preparation called Scalo, which is a mixture of whale oil soap, kerosene and naphthalene.

Naphthalene is sold in Barbados at retail, at the rate of 1s. per pound, and in quantity at 7½d. per pound. In England and the United States the price is, of course, lower, but even at the rate of 7½d. per pound, it is a very cheap material to use for the several purposes mentioned above. It possesses advantages over certain other substances for which it might be used as a substitute, since it is easy to handle, clean, and not dangerous either from being poisonous or highly inflammable or explosive in character.—*Agricultural News*.

FORESTS AND FLOODS.

Under this heading a letter in *Nature* (July 16, 1914) discusses the significant circumstances that tilled soil absorbs more rainfall than earth that has laid untouched. As an experiment, water was poured into soil contained in pots consisting of two series : (a) in which the soil was consolidated, (b) in which the soil was broken up and loose. It was observed that the water entered the soil of the undisturbed pots more slowly than the other, and that the water more quickly passed through the soil in these pots than the other. After having taken necessary precautions that the soil had been entirely wetted throughout, the pots were weighed and showed that the disturbed soil held a much greater amount of water than the consolidated soil.

It may be asked: What connection has this with forests and floods? In the letter under consideration, it is maintained that the soil in which trees are growing is looser than that which is bare; consequently it is in its best condition for absorbing and retaining the rainfall. It is maintained further that the decaying vegetation on the surface under trees has also a beneficial effect, as it absorbs water and acts as a mulch, preventing drying.

It would seem to us that the conditions obtaining in the pots are not perfectly comparable to the characters of a forest or bare hill-land soil. The presence of a covering of decaying vegetable matter in the forest introduces factors not involved in the pot experiments. The main point brought out, however, is illustrative, and well worth bearing in mind.—*Agricultural News*.

GROUND LIMESTONE.

When discussing the subject of liming, confused ideas are occasionally met with in regard to the question of limestone versus slaked lime or quicklime. Perusal of an article in the *Journal of Agriculture*, of New Zealand (April 20, 1914), will show that all the good effects resulting from the employment of quick or slaked lime on the soil may be produced with greater safety by ground limestone. The effective nature of ground limestone naturally depends to a large extent upon its mechanical condition; the finer the crushing the better the results. Chemically, limestone, like lime, is alkaline, and tends to destroy the sticky nature of soils. It further supplies a base for the formation of nitrates in the soil and liberates potash from the insoluble soil silicates and prevents potash fertilizers from passing into an unavailable condition. Limestone furthermore has a favorable influence on the availability of phosphates in the soil.

In the article referred to, mention is made of the fact that material containing limestone may also contain a high percentage of clay or other so-called impurities. It is quite possible that under

some conditions these impurities are an advantage, as for instance, when limestone is to be added to light soil. As regards the amount that should be applied per acre, experimental work in England and America indicates the reversion to the old-time custom of applying limestone in large rather than in small quantities at a time—by the ton rather than by the hundredweight. Two tons of limestone per acre is said to be the smallest amount that should be tried on an experimental scale at first. It may be noted here that, in the case of very tenacious clays, it may be found advisable to begin with a dressing of quicklime because the action of this substance is more active than that of limestone.

There is a call in New Zealand for more experiments with lime; it is suggested that demonstration plots should be laid down to show the relative efficiency of ground limestone of varying grades of fineness, and therefore of varying cost; to show the effect of varying quantities; varying methods of application; caustic lime in varying forms; the effects of these in combination with phosphates on various crops, and so on. In these as in all other manurial experiments, a number of years will be required before really decisive conclusions can be drawn as to the beneficial effects derived under the various conditions.—*Agricultural Notes*.

A NEW FIBRE DECORTICATOR.

The advantages of a new machine for scutching sisal, flax, hemp, ramie, hibiscus, jute, banana and other fibres are presented in the Queensland Agricultural Journal for July, 1914. The machine is known on the market as "La Francaise," and it is stated that all information may be obtained from Mons. F. Michotte, 45, Avenue Trudaine, Paris.

The advantages claimed for this machine are very briefly as follows: It is adaptable for all sizes of leaves or stems; it can be set up to work in the field; it is not complicated in construction nor does it require skilled attention; the work performed is said to be perfect, rapid and economical, the leaves and stalks are treated by direct attack, all the decortication is effected in one passage through the machine; the leaves or stalks have not to pass through the beaters several times as is the case with other machines; and a peculiarity of the machine is that no preliminary hand labor is required to remove the leaves, as is often the case in connection with ramie. The motor power is economical.

La Francaise will treat about 2,700 lbs. of dried leaves or stalks and 5,620 lbs. of green in a day of ten hours, producing about 337 lbs. of dry fibre. Consequently it is equal to decortivating in five days the crop of two and a half acres of hemp, representing 27,000 lbs. of stalks or leaves. The price of the machine (at the works) complete is £58 10s.

The world's record for the output of sugar for any one factory is held by Chaparra, in Cuba, which has brought its 1913-14 crop to a close with a production of slightly above 611,000 bags, or 87,300 long tons of sugar, polarizing very close to 96. The Louisiana Planter (August 1, 1914) says that this will most likely stand in no grave danger of being passed for some time to come. As a matter of fact the case just quoted is only one of the several records that have been made in Cuba on the 1914 crop.

A note on the red clay soil of Porto Rico appears in the Monthly Bulletin of Agricultural Intelligence and Plant Diseases for June, 1914. This soil is widely distributed in the island and is characterized by the high percentage of iron and aluminium, the absence of carbonates and its acidity, and deficiency in organic matter. These soils respond to manuring, particularly with lime; but certain areas, which have been continuously under sugar cane, are in a sick condition and respond to neither manuring nor liming. The reason for this is unknown, although an examination of the organic matter of these soils has been carried out by the United States Department of Agriculture.

